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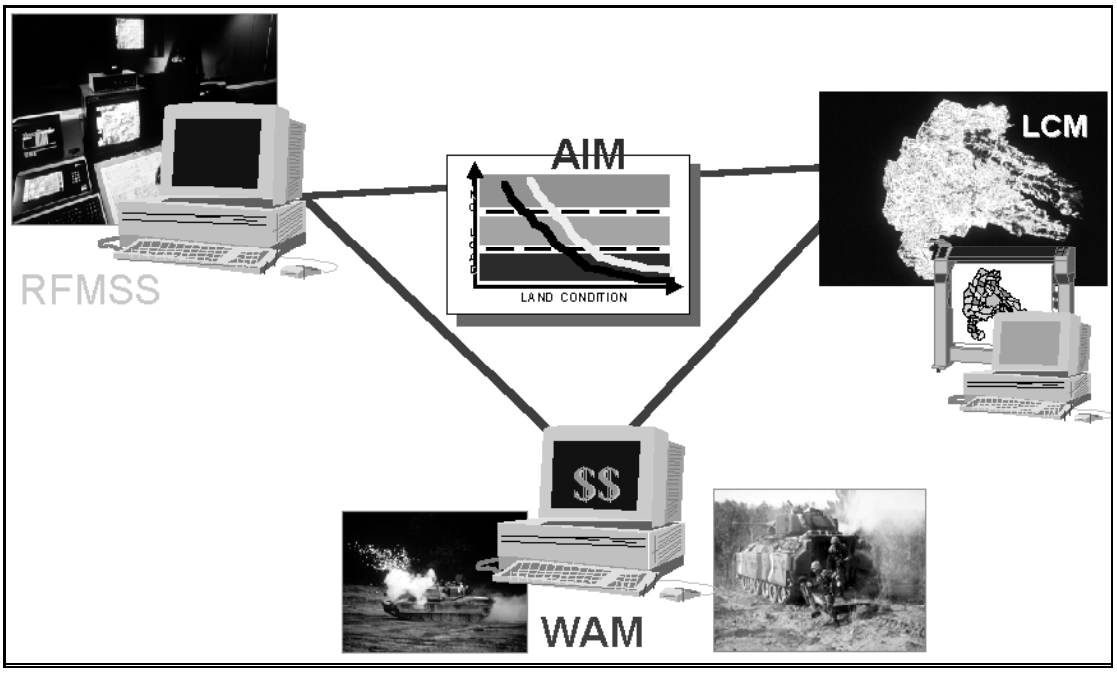
Army Training and Testing Area Carrying Capacity (ATTACC) Land Condition Module (LCM) User Manual, Version 1.00

Alan B. Anderson, Pam Sydelko, and George Teachman

July 2001



Construction Engineering Research Laboratory

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14. ABSTRACT
ATTACC is the standard ITAM methodology for estimating training land carrying capacity by relating training load, land condition, and land maintenance practices.

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Foreword

This study was conducted for the U.S. Army Environmental Center under Military Interdepartmental Purchase Request (MIPR) 1B48R00007, Work Unit KCS(TATM), "Conservation Support." The technical monitor was Mr. George Teachman, SFIM-AEC-EQN.

The work was performed by the Ecological Processes Branch (CN-N) of the Installations Division (CN), Construction Engineering Research Laboratory (CERL). The CERL Principal Investigator was Alan B. Anderson. Part of this work was done by Ms Pam Sydelko of Argonne National Laboratory and George Teachman of U.S. Army Environmental Center. The technical editor was Gloria J. Wienke, Information Technology Laboratory. Stephen E. Hodapp is Chief, CEERD-CN-N, and Dr. John T. Bandy is Chief, CEERD-CN. The associated Technical Director was Dr. William D. Severinghaus, CEERD-CV-T. The Acting Director of CERL is Dr. Alan W. Moore.

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1 Introduction

ATTACC Background

The Integrated Training Area Management (ITAM) Program is the Army's formal strategy focusing on sustained use of training and testing lands. ATTACC is part of the ITAM Program, under proponency responsibility of the Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS). ATTACC is a methodology for estimating the operations and support (O&S) costs of using land at Army installations for training and testing purposes. The ATTACC methodology includes specific processes and algorithms to predict land rehabilitation and maintenance (LRAM) requirements based on training and testing load and environmental conditions.

The ATTACC initiative began in May 1995 with a tasking from the Office of the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) and the ODCSOPS (Training Directorate) to the U.S. Army Concepts Analysis Agency (CAA). The tasking Terms of Reference specified four objectives:

2. Develop a methodology for estimating the operations and support costs of using land at Army installations for the training of ground forces.
3. Identify the key operations and support cost drivers of using land for ground force training by type of army unit and installation.
4. Develop cost estimating relationships that link land usage operations and support costs to a measure of training performance.
5. Use the cost estimating relationship to develop land-related operations and support costs of ground forces training for selected Army units and installations.

In response to the Tasking, the U.S. Army Concepts Analysis Agency, in conjunction with the ATTACC project team, submitted Study Report (CAA-SR-96-5) "Evaluation of Land Value Study (ELVS)" (U.S. Army CAA June 1996). That report outlined a methodology for meeting the stated objectives and demonstrated the methodology for heavy unit training at Fort Hood, TX. In May 1996, the Chief, Training Simulations Division, ODCSOPS (DAMO-TRS) redesignated the methodology outlined in the ELVS report as the ATTACC methodology and

extended the objectives to implement ATTACC ITAM-wide. Since then, the ATTACC project team has extended the methodology to include almost all types of Army units and institutional training and implemented ATTACC at several installations in various ecoregions. Headquarters, Department of the Army (HQDA) is using ATTACC to estimate land maintenance requirements for the ITAM Program and is integrating ATTACC into the Army's Training Resource Model (TRM), as part of direct OPTEMPO. At the installation level, the ATTACC methodology is being integrated into training land management systems to support land management decisions.

Objectives

The tasking objectives for the ATTACC initiative are listed above. The objective of this User Manual is to provide instructions for using the LCM software. The Appendix contains instructions for installing the software.

Approach

The ATTACC methodology consists of three main components: (1) training load, (2) land condition, and (3) cost analysis. ATTACC measures land condition in terms of the erosion status. Erosion status is the ratio of predicted erosion rates to tolerable erosion rates, with greater values indicating poorer land condition and lesser values indicating better land condition. Erosion rates are estimated using a modification of the Revised Universal Soil Loss Equation (RUSLE).

Several decision support tools have been developed to simplify and automate the ATTACC methodology. These decision support tools are the Workplan Analysis Module (WAM), ATTACC Integration Module (AIM), ATTACC Functions of the Range Facility Management Support System (RFMSS), and the Land Condition Module (LCM). Figure 1 shows the relationship of the ATTACC decision support tools.

The Workplan Analysis Module (WAM) consists of computer-based software programs. It (1) develops ITAM projects and costs, (2) transmits the annual workplan and its projects, and (3) updates work projects throughout the fiscal year. ITAM managers at installations, major commands (MACOMs), and HQDA use the WAM program. WAM is used to build and track ITAM projects from submission to completion and to provide standard project and workplan reports. The point of contact (POC) for WAM is Mr. Larry Jantz, Army Training Support Center (ATSC), ATTN: ATIS-ATMS, Fort Eustis, VA 23604; 757-878-3090.

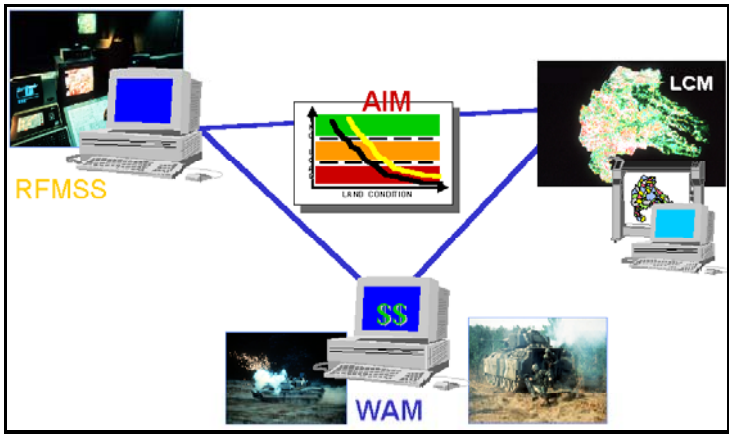

Figure 1. ATTACC software modules.

The Range Facility Management Support System (RFMSS) is a computer system that automates range control operations. It supports the key range management functions of Scheduling, Firing Desk operations, and ITAM/ATTACC. RFMSS ATTACC functions can: (1) calculate training load as events are scheduled, and (2) compare training load to Red-Amber-Green maneuver impact miles (MIMs) threshold values (generated in AIM). The RFMSS POC is Mr. Larry Jantz, ATSC, 757-878-3090.

The ATTACC Integration Module (AIM) is a computer-based software program that: (1) integrates data from WAM, LCM, and RFMSS, (2) generates LRAM funding requirements, (3) predicts land condition, and (4) calculates MIM thresholds for use in RFMSS (see the *ATTACC Handbook* for detailed information on MIMs [U.S. Army Environmental Center, 1999]). Installation-level ITAM managers use AIM to: (1) analyze WAM project data to generate LRAM requirements, (2) analyze "what-if" training scenario impact, (3) calculate MIMs for specific units and events, and (4) calculate MIM thresholds. AIM integrates the three components of ATTACC. The AIM POC is Mr. Larry Jantz, ATSC, 757-878-3090.

The Land Condition Module (LCM) is an ArcView* geographical information system (GIS)-based software application that estimates changes in land condition associated with mission activity. LCM automates the ATTACC Methodology for generating land condition curves. Land Condition Trend Analysis (LCTA)/GIS coordinators use the LCM. LCM uses installation natural resources GIS data

* ArcView is a product of ESRI, 380 New York Street, Redlands, CA, 92373-8100; http://www.esri.com

layers to generate land condition curves, which are an important input to AIM. The POC for the LCM is Mr. George Teachman, U.S. Army Environmental Center (USAEC), ATTN: SFIM-AEC-EQN, 5179 Hoadley Rd, Aberdeen Proving Ground, MD 21010-5401; 410-436-1593.

Mode of Technology Transfer

The ATTACC LCM software documented in this report is available from the Army Training Support Center. The *ATTACC Handbook* (USAEC 1999), and Army Regulation 350-4, *Integrated Training Area Management (ITAM)*, May 1998, document the standing operating procedures for implementing ATTACC.

This report will be made accessible through the World Wide Web (WWW) at URL: http://www.cecer.army.mil

2 Installing the ATTACC LCM ArcView Extension

To manually install ATTACC LCM files on your computer, complete the following tasks.

1. Copy the file *ATTACCext.avx* to your ESRI ArcView extension directory. This directory is typically "C:\ESRI\AV_GIS30\ARCVIEW\EXT32". See your ArcView documentation if you did not accept default directory names when installing the ArcView software. The *ATTACCext.avx* file is the ATTACC LCM ArcView extension. ArcView extensions are add-on programs that provide ArcView users with specialized GIS functionality. Note that the ATTACC LCM requires the ArcView extension for Spatial Analyst.
2. Copy *ATTACCLCM.hlp* and *ATTACCHandBookHelp.hlp* to your ArcView help directory. This directory is typically "C:\ESRI\AV_GIS30\ARCVIEW\HELP". See your ArcView documentation if you did not accept default directory names when installing the ArcView software. These files are the ATTACC LCM online Windows help sessions. The *ATTACCLCM.hlp* file provides an online Windows help session for using the ATTACC LCM extension. The *ATTACCHandBookHelp.hlp* file provides an online Windows help session that contains information from the ATTACC Handbook and explains the ATTACC methodology.
3. The ATTACC LCM program has now been installed. You are ready to use the LCM program.

To use the setup program to automatically install ATTACC LCM files on your computer, insert the ATTACC LCM CD into your CD drive. Select the <*Start*> button of the Windows button bar at the bottom of your screen. Select the <*Run*> menu item. A run program dialog will appear (Figure 2). Enter the CD drive letter and "*setup*". Then select the <*OK*> button. The ATTACC LCM program will begin. Follow the directions in the ATTACC LCM setup program to install the ATTACC LCM program. For more information on program installation, see the Appendix.

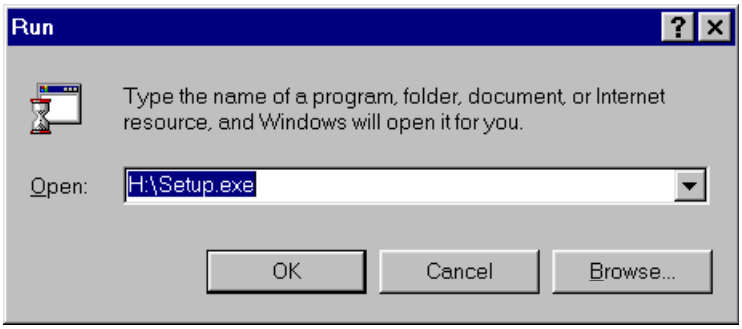

Figure 2. Windows run programs dialog box.

3 Loading the ATTACC LCM extension

To use an ArcView extension during an ArcView session, the extension must be loaded. To load the ATTACC LCM extension into ArcView, complete the following tasks after starting ArcView.

1. From the File menu, select the <*Extension*> menu option. The Extension Dialog appears, displaying the available extensions. Figure 3 shows the Arc-view menu.

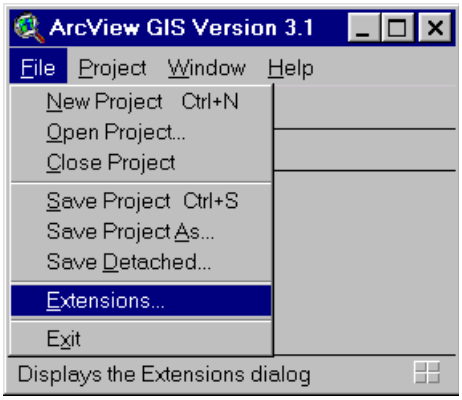

Figure 3. ArcView menu to load the ATTACC LCM extension.

2. Select the extension titled <*ATTACC LCM*>. Press the OK button. The ATTACC LCM extension is now loaded. Figure 4 shows the ArcView Extension Dialog. Notice that the information box provides additional information about the extension. The ATTACC LCM extension provides POCs for support using the ATTACC LCM.

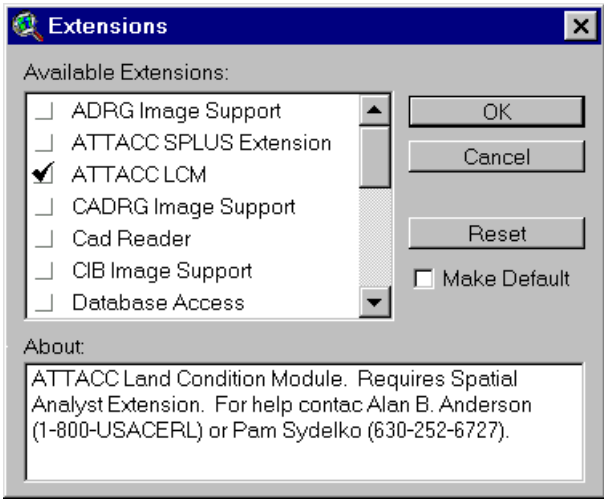

Figure 4. ArcView Extensions dialog box for selecting ATTACC LCM.

3. After loading the extension, an ATTACC LCM button will appear on a project button bar (usually the row of buttons located directly below the menu bar) whenever a project is opened. The ATTACC LCM button is not visible if a project is not opened. The ATTACC LCM button will only be visible when the project window is the active window. To run the ATTACC LCM program, press the ATTACC LCM menu button. The ATTACC LCM button looks like an ATTACC Land Condition Curve with red, yellow, and green areas. Figure 5 shows the ATTACC LCM menu button.

Figure 5. ArcView window showing ATTACC LCM button.

4. After the ATTACC LCM button is selected, the ATTACC Introduction dialog box is displayed. After selecting <*OK*> in the dialog box, the ATTACC LCM input dialog box will appear. Provide requested information and select <*OK*> to run the program. You will need to provide input data layer names, output data layer names, and analysis options. Chapter 4 provides detailed information on each input field. Online help is available when running the program. While the program is running, progress messages will be displayed in the <*Processing*> text box at the bottom of the dialog box. Figure 6 shows the introduction dialog box and Figure 7 shows the ATTACC LCM input dialog box.

Figure 6. ATTACC LCM introduction dialog box.

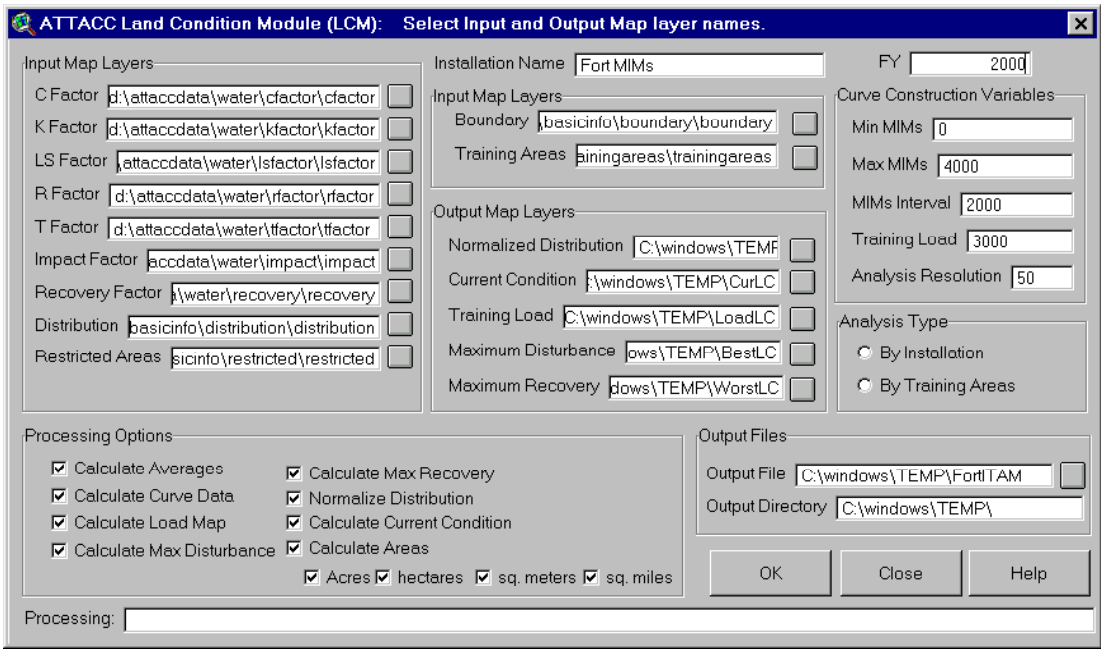

Figure 7. ATTACC LCM input dialog box.

5. After the program completes, output will be displayed in the project window. Chapter 4 describes each output in detail. Figure 8 shows typical program output.

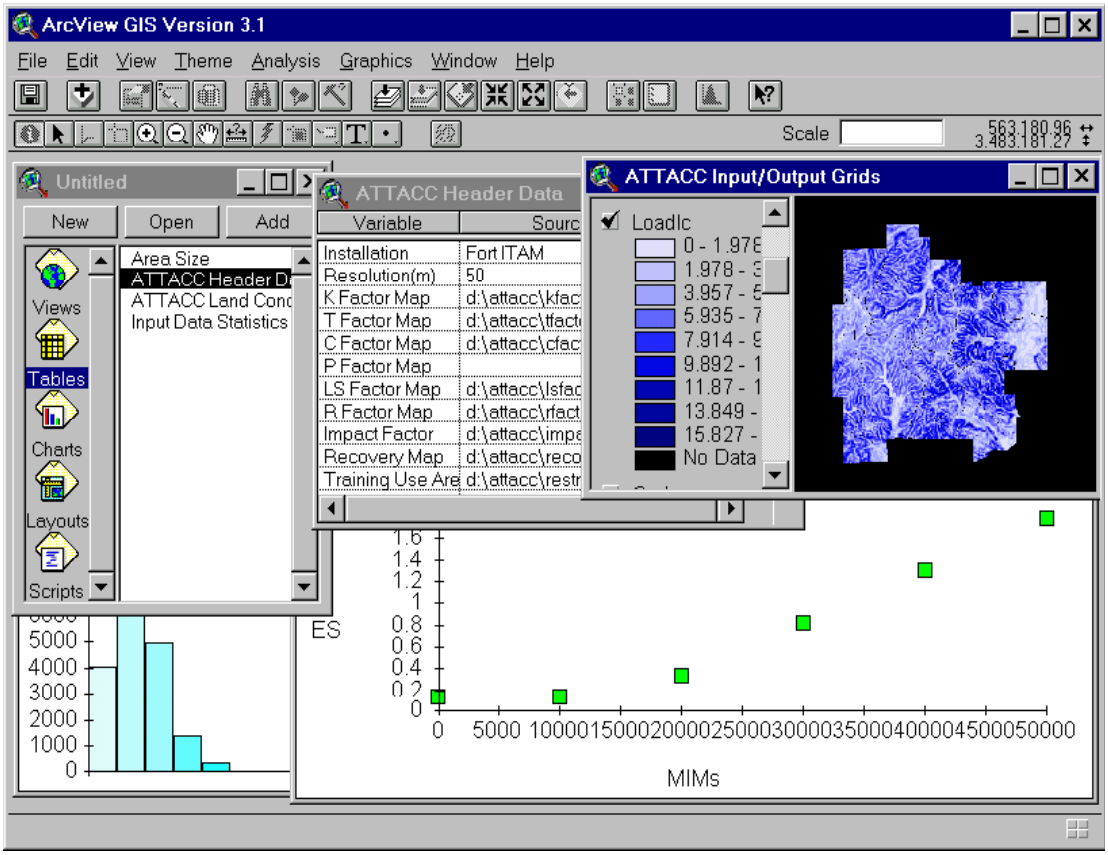

Figure 8. Typical ATTACC LCM program output.

6. To terminate the ATTACC LCM program before completion, press the <*Stop*> button on the lower right hand corner of the ArcView program window. Figure 9 shows the <*Stop*> button in a typical ArcView program window.

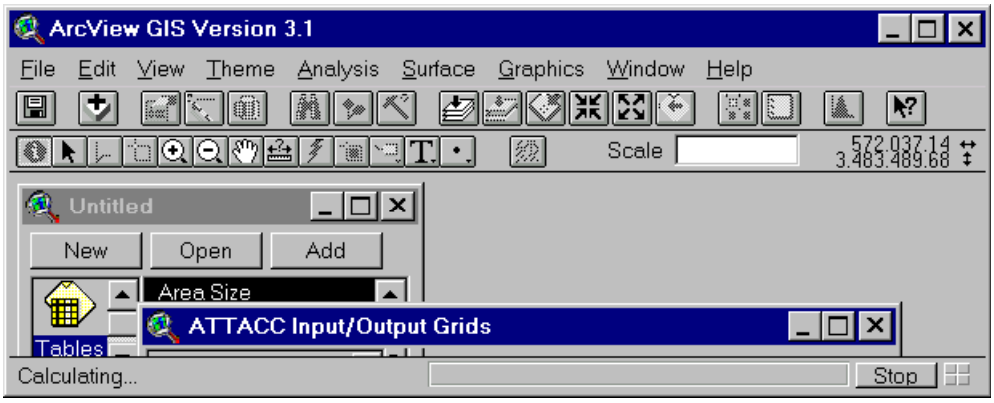

Figure 9. ArcView "STOP" button to terminate ATTACC LCM program.

You must open the ATTACC LCM extension each time you want to use it unless you set up ArcView to automatically load the extension. See the ArcView documentation provided with the ArcView GIS software for details on automatically loading extensions.

4 ATTACC LCM Program Use

ATTACC LCM Input Fields

The ATTACC LCM uses 11 input map layers. The data required depends on the analysis options selected. The ATTACC LCM disables/enables input and output fields depending on the analysis options selected. If required data is not specified or the files are missing, the ATTACC LCM will notify you of the problem. When data is lacking for one of the required input data layers, a map layer with a single installation-wide value can often be substituted until the data layer can be acquired or developed. This will allow you to use the module as you continue to develop data. The following sections summarize the data required to run the ATTACC LCM program. For more information on the ATTACC methodology refer to the *ATTACC Handbook* (USAEC 1999). The ATTACC handbook is available on the ITAM home page and is also available as a Windows help session (see ATTACC LCM Online Help, p 36).

Figure 10 shows the ATTACC LCM input dialog box. The following sections refer to each of the input fields using the same names as listed in the dialog box.

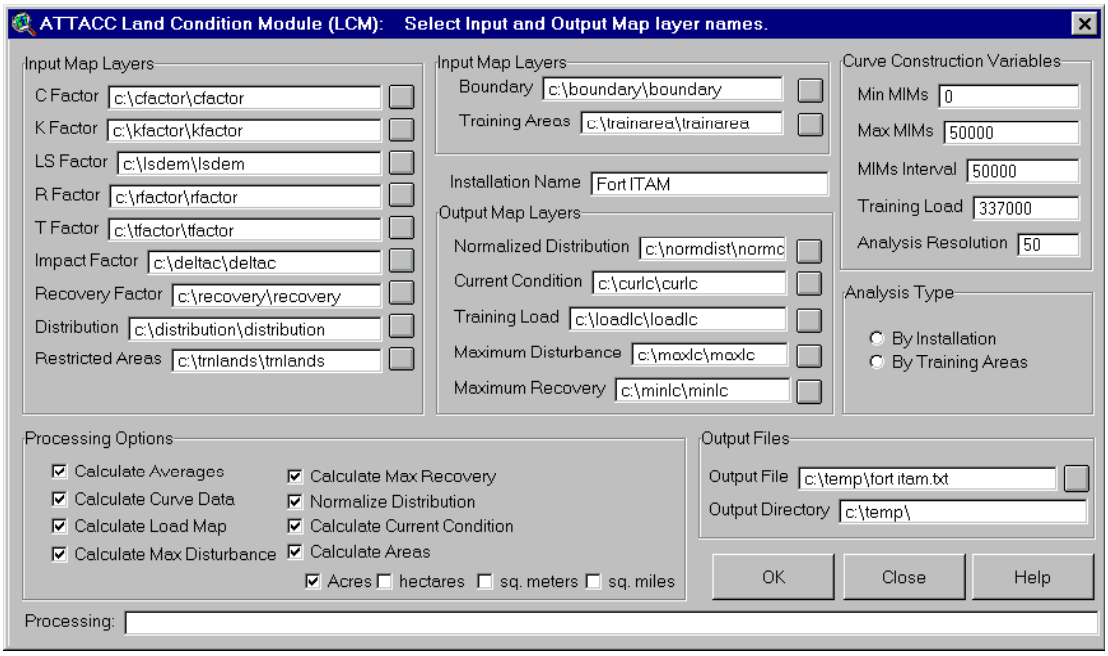

Figure 10. ATTACC LCM analysis dialog box.

The ATTACC LCM input dialog will save input values between work sessions. If you exit ArcView, the dialog box input values will be saved. The next time you use the ATTACC LCM extension, your input values will be restored.

Sections that match the ATTACC LCM dialog box sections (i.e., Input Map Layers, Processing Options, etc.) group the following information. Within each section, each input field is discussed.

Input Map Layers

Input map layers define GIS data layers required to calculate the RUSLE, and define distribution of impacts, impacts, recovery, and analysis areas. Input variables in the Analysis Type and Processing Options sections define which Input Map Layers are required. If an Input Map Layer input value is not required for the analysis options selected, the input field will be inactive and greyed out.

C Factor

The C Factor input field provides the name and location of the C factor grid map. The select file button to the right of this field can be used to select a file name for an existing file using the "file open" dialog box. The C Factor map is the current RUSLE C Factor and is often based on LCTA data.

Usually, a combination of remotely sensed data (both satellite and aerial photography) or vegetation inventory map layers and field data collected as part of the LCTA program are used to create a C Factor map layer. Algebraic approximations for estimated C Factor values (based on guidance provided in Wischmeier and Smith 1978) can be generated using computer programs that make use of LCTA data (Anderson et al. 1995; Sprouse 1998). These programs are available to military installations.

C Factor values are calculated for each LCTA plot. When C Factor values are estimated from LCTA data (or other field data plots), they are estimates for only those plots and therefore must be extrapolated across the installation for use in the ATTACC LCM. C Factor values can be extrapolated using map layers that can be correlated to vegetation cover such as classified remotely sensed data, vegetation maps, soils maps, or plot allocation strata maps. A common method of extrapolation is to calculate the average C Factor value for all the field plots within each category of the GIS map layer selected for extrapolation. For example, for the selected extrapolation map layer, find all LCTA plots within the map category and calculate the average C factor value for each category. Next, reclassify the GIS map using the average C Factor values for each category. If

there is a category that is not associated with any LCTA plots, use a related area or use a higher classification level (i.e., wetlands rather than hardwood wetlands and softwood wetlands).

Another method for extrapolating field plot C Factor values is to define a relationship between remote-sensed imagery and plot data using a statistical model that adequately defines the relationship. The statistical model relates point and image data to create the C Factor data layer. The statistical techniques used to relate point and image data could be found in Senseman et al. (1996) and Wu and Westervelt (1994).

The choice of the data source used for determining the C Factor will depend on the data available at an installation and the resolution and quality of that data. It is likely that different sources will be used for different study areas. LCTA data are expected to be an important source of data for determination of the C Factor.

K Factor

Provide the name and location of the K Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

K Factor values are available for most published soil surveys from the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS). K Factor values can also be found in the table of Physical and Chemical Properties of Soils in published soil survey manuals. The NRCS also maintains an electronic database of soil series attribute values including K Factor values. This database is the Map Unit Interpretation (MUIR) database. The MUIR database can be accessed at: http://www.statlab.iastate.edu/soils/muir. Typically, a user must reclassify the soils map layer delineating soil mapping units into a new K Factor map layer by assigning K Factor values to each mapping unit in the original soils map.

LS Factor

Provide the name and location of the LS Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

Slope length and steepness (LS) factor values can be determined from elevation files [USGS Digital Elevation Model (DEM), National Imagery and Mapping Agency (NIMA) Digital Terrain Elevation Data (DTED)], derived from digital

imagery or derived from field measurements (i.e., LCTA data, global positioning system [GPS] data).

USGS DEM is a digital file consisting of terrain elevations for ground positions at regularly spaced horizontal intervals. (The website address for more information on DEM's is: http://rmmcweb.cr.usgs.gov/elevation/dpi_dem.html). The USGS produces five different digital elevation products. Although all are identical in the manner the data are structured, each varies in sampling interval, geographic reference system, area of coverage, and accuracy; with the primary differing characteristic being the spacing, or sampling interval, of the data. Several DEM products are available for distribution over the Internet.

The NIMA has developed a standard line of terrain products called Digital Terrain Elevation Data (DTED). A DTED is a uniform matrix of terrain elevation values.

Some military installations have used digitized contour maps to derive elevation files. The scale and resolution of these elevation files depends on the contour interval and map scale of the original contour data.

Existing GIS analysis products have automated the calculation of LS Factors from DEM products (e.g., Open Grass Foundation 1993, Texas Agricultural Experiment Station 1998, Logiciels et Applications Scientifiques 1996). New techniques are being developed to improve the computation of topographic factors for the RUSLE equation, complex terrain, and large areas (Desmet and Govers 1996). An ArcView LS Calculator extension for ATTACC has been developed that implements one of these approaches (Anderson, Mitasova, and Gebhart Draft).

If a digital elevation file is not available or the resolution is undesirable, an LS Factor can be calculated for each measurement plot using slope length and steep-ness LCTA data. GPS data can be used to collect elevation data for points across the installation. LS Factor values from point data are then extrapolated across the installation. LS values are averaged and extrapolated across the installation using soils maps, remotely sensed imagery, plot allocation strata, or other spatial data sources as available.

In the absence of both DEM and field data sources, LS Factors can be estimated from published soil series descriptions by using average slope and assuming a slope length. Soil series maps can be reclassified by average soil series slope descriptions. Respective LS values for each slope class can be estimated using the

average slope and an assumed slope length. Thus, the LS Factor map layer of the installation can be created.

The choice of data source for determining the LS Factor for ATTACC depends on the data available for each study area and the resolution and quality of the data. It is likely that different sources will be used for different study areas. However, most installations have available LS Factor data. LS Factors in the ATTACC model are usually derived from the 30-m x 30-m DEM and/or LCTA data extrapolated across the installation with soils maps.

R Factor

Provide the name and location of the R Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

Rainfall and runoff (R) Factor values for the United States can be obtained from published isoerodent maps from a variety of sources (Renard et al. 1997). Isoerodent maps are essentially contour maps of R Factor values. R Factor values for the United States are also available by county from the Revised Universal Soil Loss Equation (RUSLE) computer program CITY database (Renard et al. 1997). Published R Factor values are also available for other countries (Rogler and Schwertmann 1981). R Factor values can also be calculated directly from local precipitation data (Renard et al. 1997). The current ATTACC implementation uses R Factor values from the published isoerodent maps (Renard et al. 1997).

T Factor

Provide the name and location of the T Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

Soil loss tolerance (T) Factor values are available for most published soil surveys from NRCS. T Factor values can be found in the table of Physical and Chemical Properties of Soils in soil survey manuals. The NRCS also maintains the MUIR database of soil series attribute values, including T Factor values. Digital soil surveys (see K Factor for details) are reclassified in a GIS using soil series T Factor values from the MUIR database to produce T Factor maps.

Impact Factor

Provide the name and location of the Impact Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

The Impact Factor is the change in the C Factor data that results from a single pass of a vehicle. Vehicle impact data are available from a variety of sources such as installation studies, published literature, LCTA data, and/or subject matter experts. The choice of data sources for the ATTACC model will likely vary between installations.

Experimental impact studies that specifically examined the impact of military vehicles on installation resources have been completed (Silcox 1995; Thurow, Warren, and Carlson 1995; Van Horne and Sharp 1998; Watts 1998; Wilson 1988). Many of these studies quantify the impact of single and multiple passes of a vehicle. Data from these studies can be used to estimate a change in the C Factor associated with a pass of a vehicle. The data from these studies must then be extrapolated across the installation. Results of studies of related impacts such as off-road civilian vehicle impact studies can also be used to infer changes in the C Factor associated with vehicle impacts. Data can be extrapolated by vegetation type, soil type, or other relevant spatial data.

For installations not having experimental studies or off-road vehicle impact studies, LCTA data can be used to estimate the change in C Factor values resulting from training impact (Shaw and Diersing 1989; Shaw and Diersing 1990; Warren and Bagley 1992; Shaw et al. 1990). During the collection of LCTA field data, a determination of the presence or absence of vehicle disturbance is made at each point-intercept along the line transect. This determination allows each field measurement plot to be divided into disturbed and undisturbed subsets. A C Factor value for disturbed and undisturbed subsets can be calculated. The difference between disturbed and undisturbed values is an estimate of the impact on vegetative cover due to a single pass of vehicle traffic. This difference is called the Training Impact Factor in the ATTACC methodology.

An average Training Impact Factor is calculated for a group of plots representing similar environmental conditions. The Training Impact Factor is then extrapolated across the installation using an installation's vegetation, soils, plot allocation strata maps, and/or other relevant GIS maps.

Recovery Factor

Provide the name and location of the Recovery Factor map. The "select file" button can also be used to select a file name using the "file open" dialog box.

The Recovery Factor is the recovery period (expressed in number of years) that an area requires to naturally recover the amount of plant cover typically found in an undisturbed area. Recovery periods are available for some installations from

experimental data. Unfortunately, these types of data are not always available or possible to collect. Estimates of natural recovery can also be obtained from the literature, subject matter experts, or personal experience.

Frequently in the ATTACC methodology, installation ITAM personnel (or designated experts) estimated recovery rates. These estimated recovery rates are associated with maps representing vegetation type, soil type, or another spatially distributed land features, so that the information can be extrapolated across the installation. Expert opinions were validated using experimental data on recovery rates and literature, where available and applicable.

Distribution

Provide the name and location of the Distribution map. The "select file" button can also be used to select a file name using the "file open" dialog box.

An important aspect to adequately modeling the impacts of training and testing activities is the spatial distribution of land use activities. Land use activities are not distributed uniformly across the installation. The training Distribution map should reflect the effects of topography, vegetation, and other environmental influences on the distribution of land uses such as training and testing. It should also reflect the doctrinal requirements of training and historic land use patterns. In ATTACC, the methodology to create this data layer is flexible but the land use patterns estimated should reflect actual land use.

Evidence of historic disturbance can be used as a surrogate measure of future training use distribution. To spatially extrapolate historic data, measures of disturbance from field plots are statistically related to spatial data. The statistical techniques that relate point and spatial data can be very simple or very complex.

Standard LCTA core plot data are often used to quantify disturbance since percent of plot disturbed is a standard data element. LCTA disturbance data can be averaged by training area (Linn and Gordon 1993), related to remotely sensed imagery (Wu and Westervelt 1994), or related to GIS spatial data (Guertin et al. 1997).

In the absence of ground-truth data, remotely sensed imagery can be used to estimate the percentage of area that is denuded of vegetation. This assumes loss of vegetation is due to land use activity and is proportional to the amount of land use activities. This approach was used in the Fort Hood Maneuver Activity Damage Assessment Model (MADAM) (Sedlak and Brown 1992).

The utility of the different methods depends on availability of remotely sensed imagery and field disturbance data. Some methods work better than others depending on the characteristics of the site and the mission activities.

In the ATTACC methodology, LCTA disturbance data was correlated with remotely sensed imagery and GIS data such as slope, vegetation and soil types, and distance from roads, cantonment, and firing points. A statistical model was developed quantifying the relationships between field data and these various spatial data. Once statistically insignificant data layers were removed, the statistical model is used to produce a disturbance map. Each grid in this map is assigned a value between 0 and 100 that represents the percentage of disturbed land in that grid.

Restricted Areas

Provide the name and location of the available lands map. The "select file" button can also be used to select a file name using the "file open" dialog box.

Training lands include lands available for training, under installation control, and that are the responsibility of the installation to maintain as part of the ITAM Program. Typically, there are also lands within an installation that are restricted to training. These lands not available for training are identified through discussions with the installation range control office.

A Restricted Areas map required by the ATTACC LCM is a training lands map produced by combining and reclassifying a number of thematic data layers within a GIS. Common data layers include: installation boundary, cantonment, bodies of water, impact areas, and other data layers that capture restricted uses. These maps have generally been available as digital maps at the installation or can be digitized from installation paper maps. The GIS data layers that delineate restricted training areas are overlaid in a GIS to produce an available training lands map.

The designation of lands available for training should be consistent with the designations used in the RFMSS system. Lands not available for scheduling training activities should not be included in the available training lands map. However, some lands within training areas that have access restrictions should be removed from the available training lands map.

Boundary

Provide the name and location of the installation Boundary map. The "select file" button can also be used to select a file name using the "file open" dialog box.

A Boundary map delineates the land areas considered part of the installation. This data layer is required when estimating land condition for the installation as a whole.

Training Areas

Provide the name and location of the Training Areas map to use in the training areas analysis. The "select file" button can also be used to select a file name using the "file open" dialog box.

A Training Area map delineates land units used for scheduling and conducting military training. This map should be consistent with the Training Area map used for scheduling training in the RFMSS program. This data layer is required when estimating land condition for individual parcels of land that match the same parcels of land as they are managed in the RFMSS program.

Training area names from the Training Areas map are used in the AIM output file. If the training area names do not match training area names in AIM, the AIM program will not be able to properly link environmental, training, and cost data.

Output Map Layers

Output Map Layers are GIS data layers created from Input Map Layer variables defined in the previous section. Input variables in the Analysis Type, Processing Options, and Curve Construction sections define which output map layers will be created. If an Output Map Layer input value is not required for the analysis options selected, the input field will be inactive and greyed out.

Normalized Distribution

Enter the name and location to be used for the Normalized Distribution map. The "select file" button can also be used to select a file name using the "file open" dialog box.

The ATTACC LCM program uses the Distribution map to create the Normalized Distribution map. The cell values of the Normalized Distribution map are the

percentage of the total MIMs that should be allocated to each cell. This normalized map must be recreated each time the analysis resolution, Distribution map, Restricted Areas map, Boundary map, or Analysis Type changes. When the model is rerun, the Normalized Distribution map can be used without creating a new map from the Distribution map to speed up the program.

Current Condition

Enter the name and location to be used for the Current land Condition map. The "select file" button can also be used to select a file name using the "file open" dialog box. The Current Condition map is a map of erosion status values for the initial conditions of the input maps. This map is provided to help you evaluate the quality of input maps. The Current Condition map should be representative of installation conditions for the data provided.

Training Load

Enter the name and location to be used for the Training Load map. The "select file" button can also be used to select a file name using the "file open" dialog box. The Training Load map is a map of predicted erosion status values for the training load specified as the Projected Training Load (see page 27).

Maximum Disturbance

Enter the name and location to be used for the Maximum Disturbance map. The "select file" button can also be used to select a file name using the "file open" dialog box. The Maximum Disturbance map shows predicted erosion status values for the maximum level of disturbance. This map is provided to help you evaluate the quality of input maps. The Maximum Disturbance map should contain represent maximum erosion rates typical of denuded sites at the installation.

Maximum Recovery

Enter the name and location to be used for the Maximum Recovery map. The "select file" button can also be used to select a file name using the "open file" dialog box. The Maximum Recovery map shows predicted erosion status values for the maximum recovery of sites. This map is provided to help you evaluate the quality of input maps. The Maximum Recovery map should reflect minimum erosion rates typical of rested sites at the installation.

Curve Construction Variables

Curve Construction Variables are number values that define how the ATTACC land condition curve will be constructed. Input variables in the Processing Options section define which Curve Construction Variables are required. If a Curve Construction Variable is not required for the analysis options selected, the input field will be inactive and greyed out.

Minimum MIMs

This value is used to determine the minimum training load value to use in developing the land condition curve. This value defines the minimum X axis value on the ATTACC land condition curve. This value is normally left at zero.

Maximum MIMs

This value is used to determine the maximum training load to use in developing the land condition curve. This value defines the maximum X axis value on the ATTACC land condition curve. A reasonable value will depend on the size of the installation and installation-specific input maps. The value should cover the range of MIMs values required for the ATTACC land condition curve to reach a threshold.

MIMs Interval

When developing a land condition curve, this value is used to determine how many data points should be used to develop the curve. Smaller intervals capture the shape of the curve better but require more processing time. Larger intervals may be useful when developing and evaluating new data layers. Smaller intervals may be more useful when fitting a curve to the data for final use in AIM.

Projected Training Load

Projected Training Load is the expected training load in MIMs. This value is used to estimate the land condition of a specific training load. The value is typically the expected MIMs load for an area of interest and is obtained from the RFMSS or AIM program.

Analysis Resolution

Specify the resolution of analysis for all calculations. The Analysis Resolution should be set to the resolution of the lowest resolution map. Lower resolution

values (larger numbers) are often used when first running the ATTACC LCM program. Lower resolution values allow the program to run faster. However, a correct analysis resolution should be set before generating final land condition curve data for the AIM.

Analysis Type

Select the Analysis Type desired. Installation summaries will result in a land condition curve for the whole installation. The Training Areas summary will generate land condition curves for each training area. The installation is defined by the Boundary map and the Available Lands map. Training Areas are defined by the Training Area map and the Available Lands map.

Output Files

The Output Files input fields define where output and temporary files will be stored.

Output File

The Output File name listed will be used to name the output text file that contains a summary of all calculated data. This text file stores all header, archive, and curve data for a specific run of the ATTACC LCM. This file is useful for archiving data from several runs of the ATTACC LCM program.

Output Directory

The Output Directory listed in the input box will be used to store all temporary data and output files. Temporary files are stored to this directory to allow you to easily cleanup the computer hard drive after running the program. Terminating the program early may leave temporary data files. The program also stores copies of displayed data to this directory.

Processing Options

The Processing Options variables define the required analysis and output options. If no processing options are selected, all other input fields will be inactive and greyed out. As options are selected, the required input fields will be activated.

Calculate Averages

Check this box to Calculate Average, minimum, and maximum values for each input data layer. Summary data is stored to a table in the ArcView project. This summary is provided to help you check this input data.

Calculate Curve Data

Check this box to generate data to estimate the ATTACC Land Condition Curve. The output will be saved to a table in the ArcView project. The Land Condition Curve data will be estimated for training loads over the range defined by the Curve Construction Variables "Minimum MIMs," "Maximum MIMs," and "MIMs Intervals."

Calculate Load Map

Check this box to estimate land condition for the projected training load. The output map will be saved to the file name listed in the Training Load map input box listed in the Output Map Layers section. Land condition will be estimated for the Curve Construction Variable Projected Training Load.

Calculate Maximum Disturbance Map

Check this box to estimate land condition with maximum disturbance. The output map will be saved to the file name listed in the Maximum Disturbance input box of the Output Map Layers section. Check this box to estimate land condition with maximum disturbance. The output map will be saved to the filename given to the Maximum Disturbance under the Output Map Layers section.

Calculate Maximum Recovery Map

Check this box to estimate land condition with maximum recovery. The output map will be saved to the file listed in the Maximum Recovery map input box listed in the Input Data section.

Normalize Distribution

Check this box to normalize the Distribution map. If this box is checked, the Distribution map listed in the input section will be used to develop the normalized map. The normalized map will be saved to the file name listed in the Normalized Distribution input box of the Output Map Layers section. Note: exist-

ing maps will be over written. If this box is not checked, the map listed in the normalized distribution map will be used to develop land condition curves.

Calculate Current Land Condition Map

Check this box to estimate current land condition. The output map will be saved to the file name listed in the Current Land Condition input box of the Output Map Layers section.

Calculate Areas

Check this box to calculate area sizes for installation/training areas. This option requires the selection of one or more units of measure to display area sizes. This summary is provided to help you evaluate the ATTACC LCM input.

Other Input Fields

The following input fields and buttons provide titles for output, access to help sessions, and control execution of the ATTACC LCM program.

Installation Name

Provide the Installation Name. The name is used to document output. The installation name is used in the AIM output file. The installation name must be the same as the installation name used in AIM. If the installation names are not the same, the AIM program will not be able to properly link environmental, training, and cost data.

FY

Provide the analysis Fiscal Year. The year is used to document output. The fiscal year is used in the AIM output file. The fiscal year must be the same as the fiscal year used in AIM. If the fiscal years are not the same, the AIM program will not be able to properly link environmental, training, and cost data.

OK Button

Press the OK button process the selected ATTACC LCM options. If required input data is missing, you will be prompted for the missing data.

Close Button

Press the CLOSE button the exit the ATTACC LCM program.

Help Button

Press the HELP button to get online help on the use of the ATTACC LCM program. Additional help on the ATTACC methodology is available in the online ATTACC Handbook help file.

Select File Buttons

The Select File buttons are the square buttons next to each input box that requires a file name. Select this button to open a file open/save dialog box. Use this dialog box to locate input files and to name output files.

Processing Messages Display

While the ATTACC Land Condition Curve ArcView program is processing your requests, processing status comments will be displayed in this message line.

ATTACC LCM Output

The ATTACC LCM produces several types of output depending on the analysis options selected. The following information summarizes typical ATTACC LCM output. Each time you run the ATTACC LCM, the current output will overwrite the old output. If you want to save any output from earlier runs, you need to save the data with a new name.

Land Condition Curve

The basic output of the ATTACC LCM program is the ATTACC Land Condition Curve for an installation, a set of training areas, or any other designated management unit. The land condition curve is displayed by the ATTACC LCM as a graphical representation of the tabular data that will be transferred to the AIM program. Figure 11 shows a typical land condition curve calculated at the installation level. The land condition curve allows you to easily view the shape of the curve. Figure 12 shows the same installation level land condition data in tabular format. The tabular format is used in the AIM module and can be used in other applications. Land condition curve data is generated for both installation summaries and training area summaries.

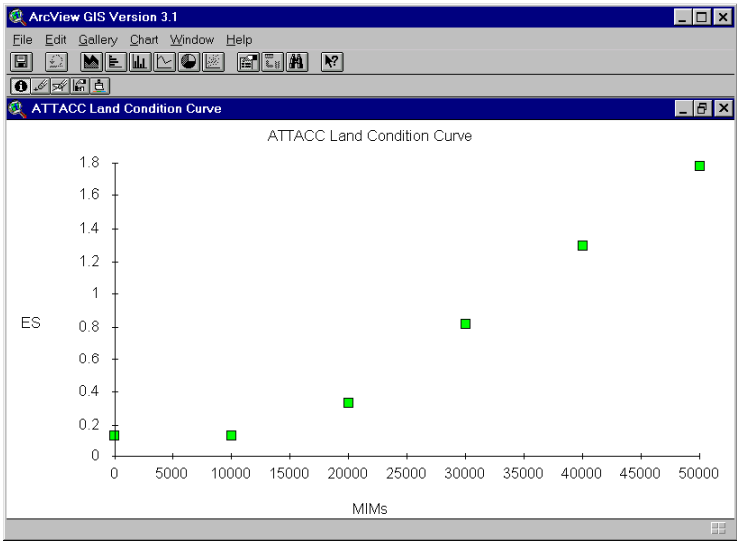

Figure 11. ATTACC land condition curve.

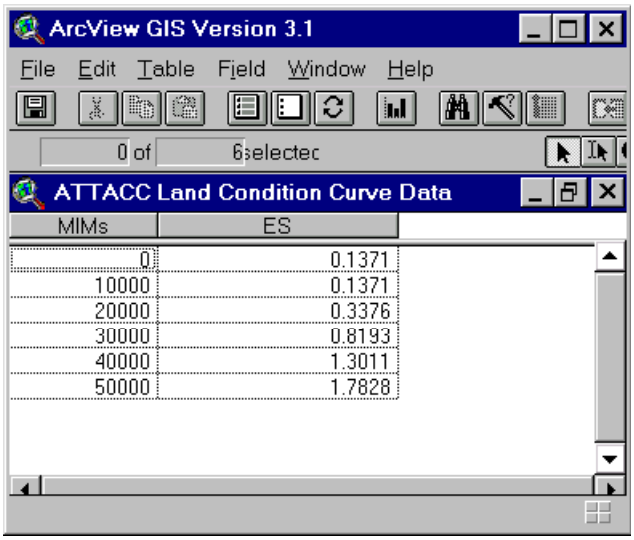

Figure 12. Land condition curve tabular data.

Input/Output Maps

The ATTACC LCM program also displays the input and output grid maps in a view titled "ATTACC Input/Output Grids." Figure 13 shows a typical input/output map view. The input and output maps are displayed so you can evaluate the input and output to see if the model is performing reasonably. Input maps include LS Factor, C Factor, R Factor, K Factor, Boundary, Restricted Areas, Training Areas, and Training Distribution. One map is shown for each required input data layer. An output map is shown for each analysis option selected. Output maps include Normalized Distribution, Training Load Land Condition, Maximum Disturbance Land Condition, and Maximum Recovery Land Condition.

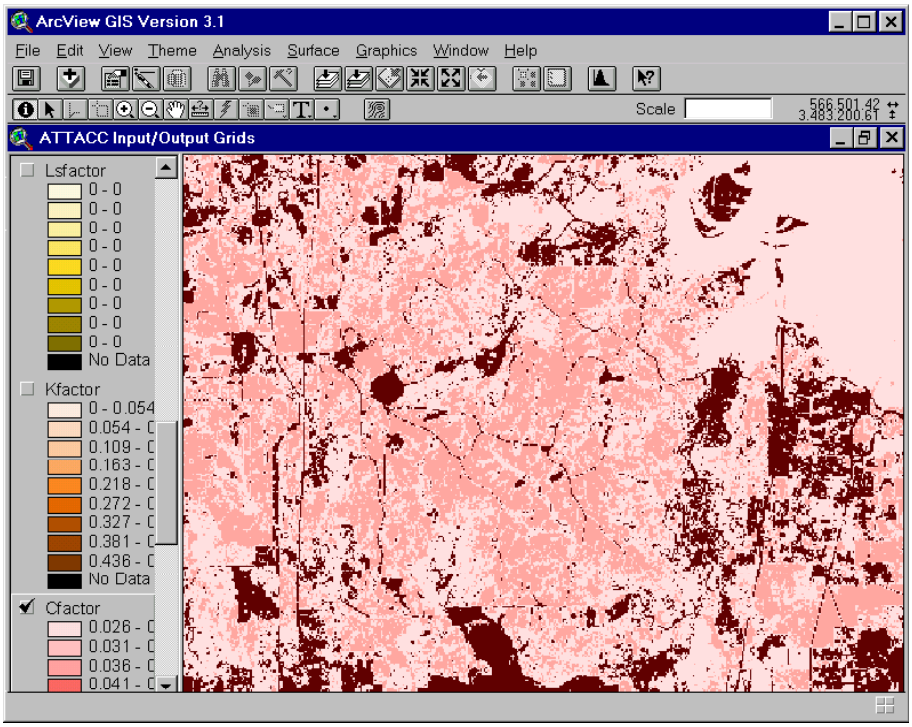

Figure 13. Input/Output map display.

Metadata

A table listing each input and output data source is provided. This table is used to document the input and output sources for each run of the ATTACC LCM. If you are comparing model runs using alternative data sources, this table provides a means to identify each run of the model. The metadata table will list all potential input data layers. However, values will be provided only for the data layers actually used in that specific run of the ATTACC LCM. Figure 14 shows a typical metadata table.

Output Map Histograms

For several of the output maps, a histogram of map values is provided. Histograms are provided for current land condition and training load land condition. The histograms allow you to see the distribution of erosion status values for the area of interest. Histograms are provided only for installation-level summaries. Output by training areas creates too many histograms for viewing. If you want a histogram for an individual training area, you can use a boundary map for the training area and rerun the ATTACC LCM. You can also use ArcView tools to create a histogram for a specific training area (see ArcView documentation). Figure 15 shows a histogram for an output map.

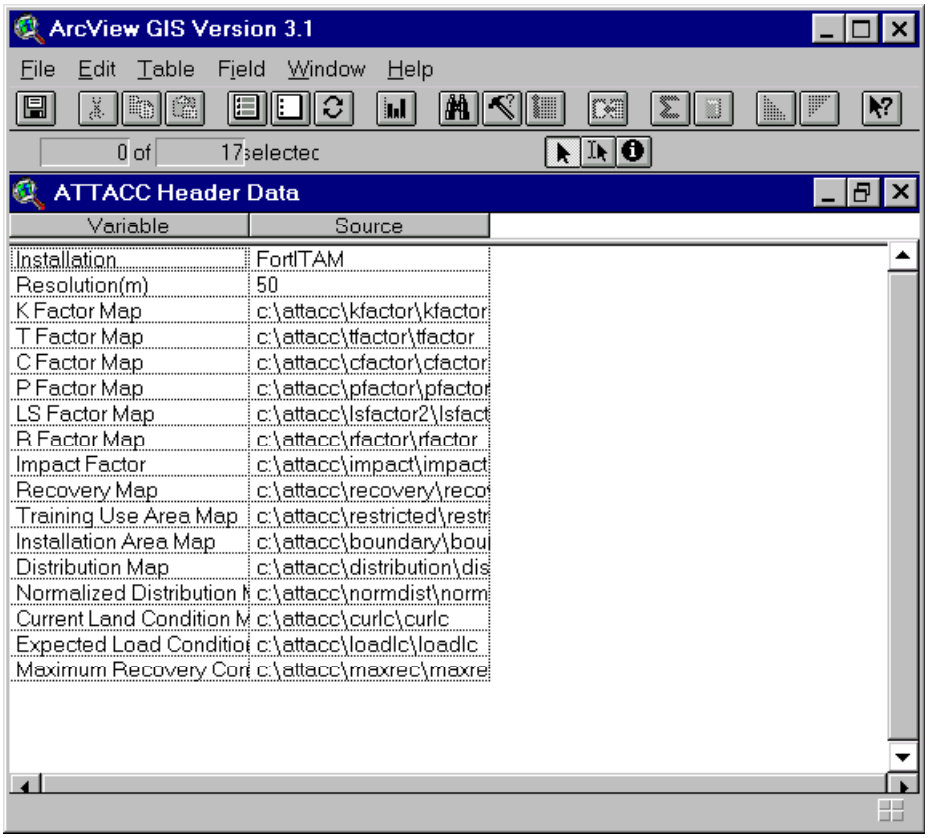

Figure 14. LCM metadata output table.

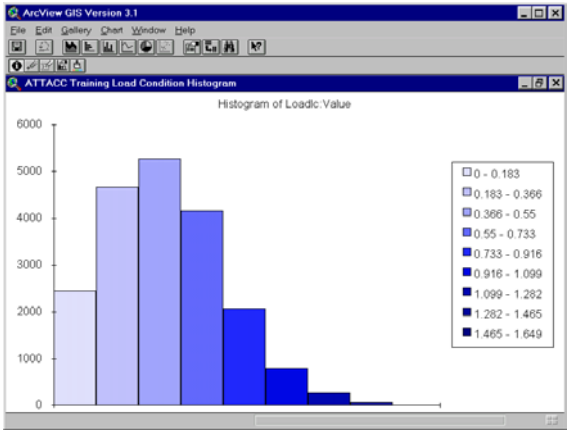

Figure 15. Histogram of land condition values.

Area Sizes

Installation or training area sizes are provided by the ATTACC LCM. This output is provided as a quality control check. The area sizes should match expected values. If values are not reasonable, one or more input maps (usually boundary, training areas, restricted areas) may have data values that are not appropriate for the ATTACC LCM. Figure 16 shows a typical area size output table.

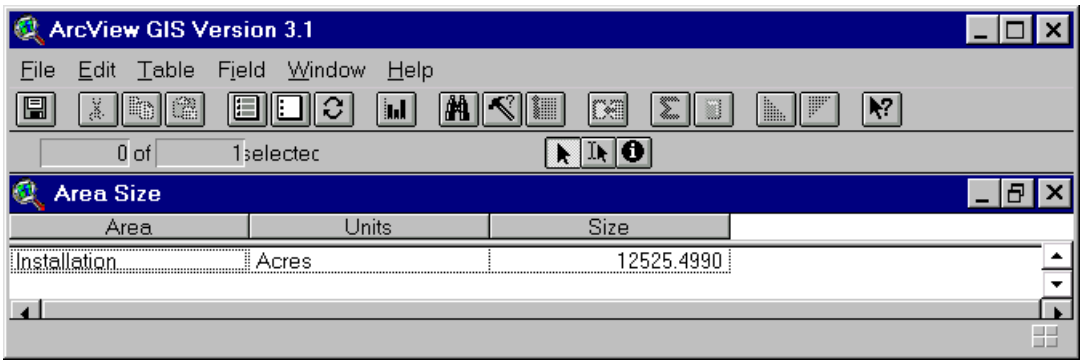

Figure 16. Area size output table.

Map Statistics

Output map statistics can be generated for each input map. Output statistics include maximum, minimum, and average values. This output is provided as a quality control check on the input data. Output statistics for each input map should match expected values. Maximum and minimum values help identify eroneous data. Figure 17 shows a typical map statistic output table.

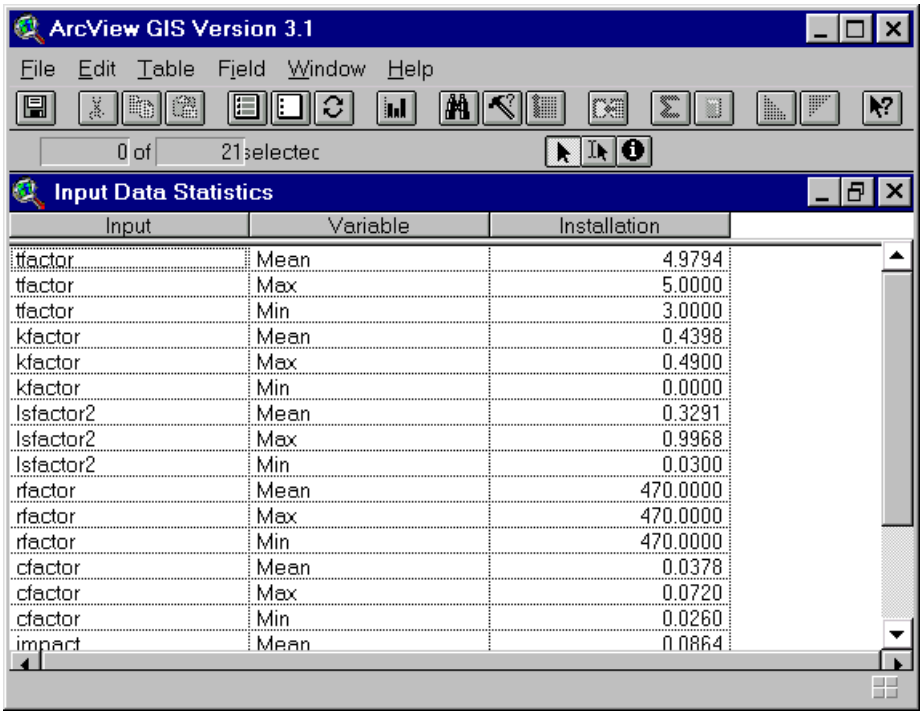

Figure 17. Map statistics output table.

ATTACC LCM Online Help

A help button is available in the ATTACC LCM analysis dialog box. This button provides access to two online Windows help sessions. Figure 18 shows the ATTACC LCM help files dialog box. An ATTACC LCM help session provides information on use of the ATTACC LCM program. This help session provides basically the same information as this ATTACC LCM User Manual. A second help session provides information from the *ATTACC Handbook*. This help session provides information on all aspects of the ATTACC program.

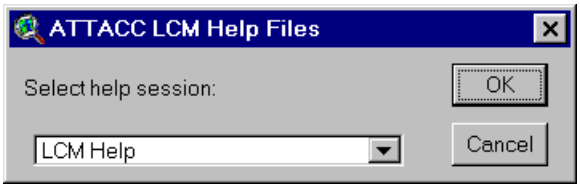

Figure 18. Help session dialog box.

5 Transferring ATTACC LCM Data to AIM

Currently, data is transferred between the ATTACC LCM and AIM programs by copying data from the "ATTACC Land Condition Curve (ES)" ArcView data table to the AIM program. The ATTACC LCM program automatically saves this data to a file in the specified working directory in a format compatible with the AIM program. The file name is always "AIM.dbf". Land condition curve data can also be manually exported to several data formats. Figure 19 shows the export menu option in ArcView. Figure 20 shows the output format options. The output file is provided to the AIM user. Future versions of ATTACC LCM and AIM programs will automatically share data.

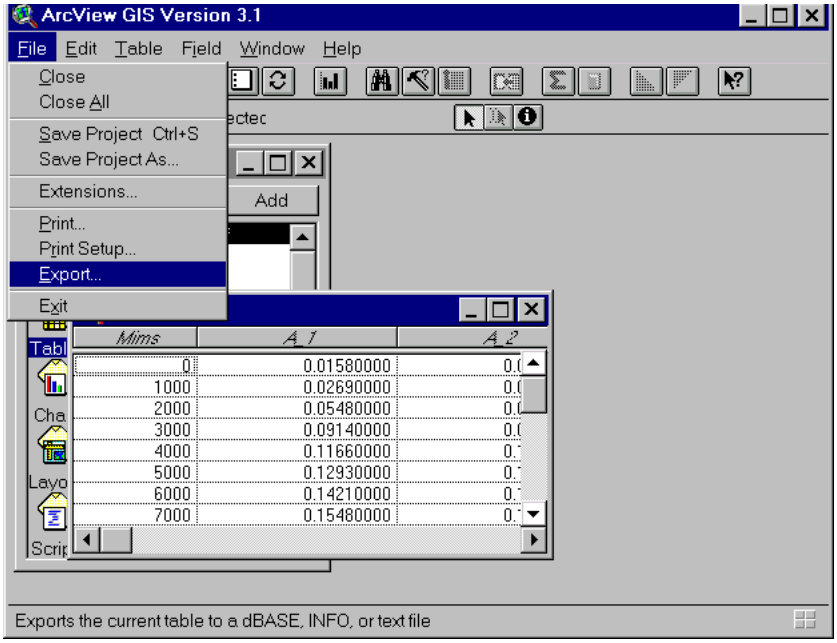

Figure 19. Land condition data export menu option.

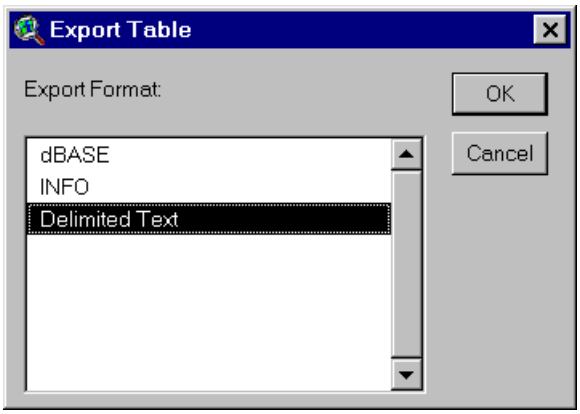

Figure 20. Export data formats for land condition data.

6 Hints On Using the ATTACC LCM

The following suggestions will help when using the ATTACC LCM ArcView extension.

When you first develop a land condition curve for your installation, there are several approaches that can save you some time. The following options exist when first implementing ATTACC:

1. When first running an application, you may want to set the analysis resolution to a larger number. This results in a more coarse spatial resolution and quicker processing time. This will allow you to identify any input data problems quickly. When you are satisfied that all input data are usable, then set the analysis resolution based on the actual accuracy of the input data.
2. When first developing land condition curves, set the MIMs Interval to a larger number so that about 5 to 10 data points will be produced for the range of MIMs value specified. This will allow you to determine if you have the correct range specified. Once you have determined a reasonable range of MIMs that captures the shape of the land condition curve for the area of interest, you can use a smaller MIMs Interval to create a more detailed land condition curve for use in the AIM program.
3. You need to generate a normalized distribution map only once unless you change the analysis resolution or change between training area and installation analysis. Not calculating the normalized distribution reduces execution times. Remember that you will not get valid results if you do not recalculate the normalized distribution map when you change analysis resolution or analysis type.

When first developing a land condition curve, check the validity of the data. Look at the initial, training load, maximum recovery, and maximum disturbance land condition maps to see if the results are reasonable. Look at the area size and input map statistics for values that are not reasonable for your installation.

When first developing a land condition curve, you may have multiple sources of data for required model input. You can use both data sources to assess the effect of the alternative data sources. Run the ATTACC LCM once with each data source. Save appropriate output to a new name. You can then compare results and determine which data is most appropriate for your installation.

7 ATTACC LCM Error Messages

The ATTACC LCM ArcView tool displays two types of error messages. First, ATTACC LCM error messages inform you of errors specifically related to using the ATTACC LCM. These error messages are related to the ATTACC LCM scripts. Second, ATTACC LCM displays error messages generated by ArcView. These error messages are related to ArcView scripts that come with ArcView and are used by the ATTACC LCM scripts.

All ATTACC LCM error messages can be identified by the word "ATTACC" somewhere in the message or dialog box. ArcView error messages will not include the word "ATTACC" anywhere in the message or dialog box.

You will frequently see several messages in succession. The first message is usually the most informative message that describes the original problem. Subsequent messages usually describe problems resulting from the first problem.

ATTACC LCM will terminate for major errors and return you to the input dialog box. For minor problems that usually do not affect results, the ATTACC LCM will complete the current analysis.

If you terminate a run of the ATTACC LCM by using the "Stop" button, you will usually see a couple of error messages. These error messages can be ignored. They are simply indicating that some portion of the script was not completed and may result in invalid output.

8 ATTACC LCM Technical Support

For support using the ATTACC LCM program you may contact any of the following POCs. If you identify program bugs or have suggestions for improving the program, please provide this information to any of the following POCs.

Alan B. Anderson (ERDC)
Phone: 800-USA-CERL (800-872-2375) ext 6390
Email: alan.b.anderson@erdc.usace.army.mil
Fax: 217-373-7266

Pam Sydelko (ANL)
Phone: 630-252-6727
Email: psydelko@anl.gov
Fax: 630-252-5128

Gordon Weith (ATSC)
Phone: 757-878-3090
Email: weithg@atsc.army.mil

George Teachman (USAEC)
Phone: 410-436-1593
Email: george.teachman@aec.apgea.army.mil
U.S. Army Environmental Center
ATTN: SFIM-AEC-EQN
5179 Hoadley Road
Aberdeen Proving Ground, MD 21010-5401

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Wu, X., and J.D. Westervelt. 1994. *Using Neural Networks to Correlate Satellite Imagery and Ground-truth Data*. USACERL Special Report EC-94/28/ADA285486, 53 pp.

Appendix A: Installing the ATTACC LCM and Related Tools

To manually install any ATTACC LCM related software tools refer to Chapter 2 of the main text for the specific tool for complete instructions.

To use the setup program to automatically install ATTACC LCM and related tools on your computer, insert the ATTACC LCM CD into your CD drive. Select the *<Start>* button of the Windows button bar at the bottom of your screen. Select the *<Run>* menu item. A run program dialog will appear (Figure A1). Enter *"drive:\setup.exe"* in the text-input box where "*drive*" is the CD drive letter. You may also use the browse button to locate and select the "*setup.exe"* file (Figure A2). Then select the *<OK>* button. The ATTACC LCM installation program will begin.

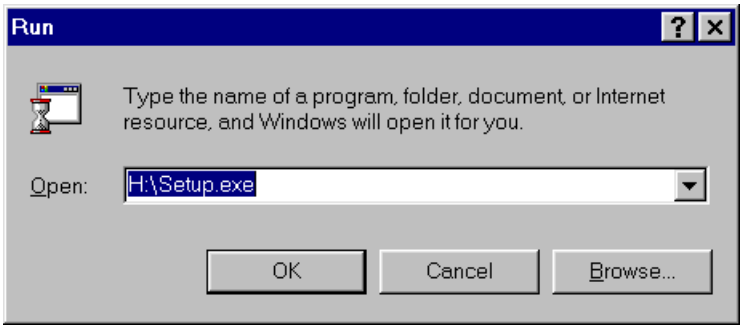


Figure A1. Windows run programs dialog box.

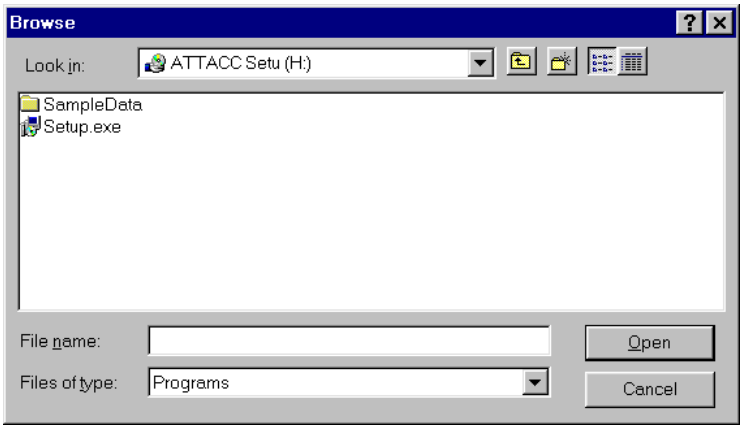


Figure A2. Browse dialog box used to locate installation program.

You will see the ATTACC setup initialization screen (Figure A3). After a few seconds the initialization process will be completed and the ATTACC LCM installation setup welcome screen (Figure A4) will appear. If you do not see the welcome dialog box, you already have a version of the ATTACC LCM installed on your computer. See the *Removing and Updating ATTACC LCM and Related Tools* section of this appendix if you already have a version of the ATTACC LCM installed. Select <*Next*> to continue or <*Cancel*> to terminate the installation. You may cancel the installation at anytime and all installation files will be removed from your computer system.

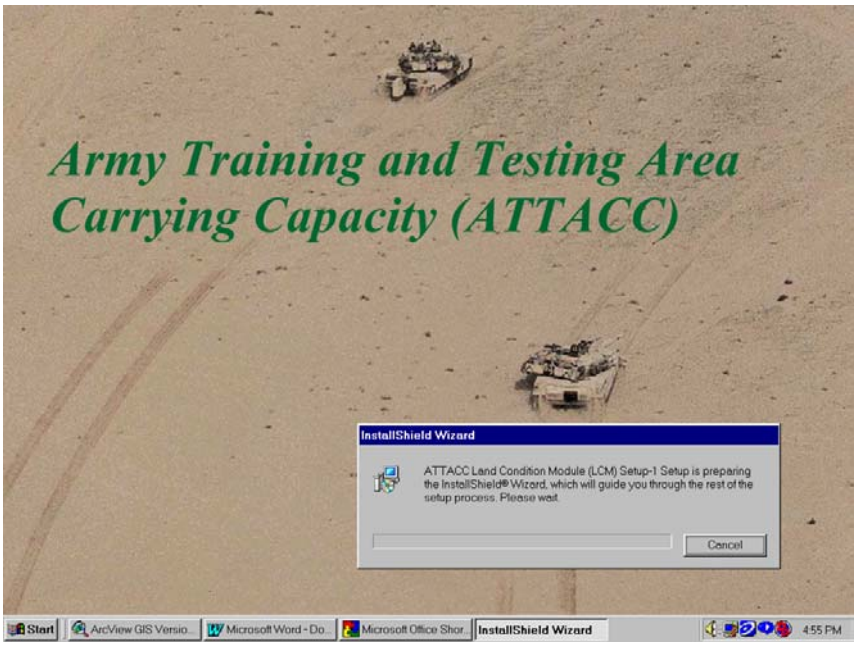


Figure A3. ATTACC LCM installation program initialization screen.

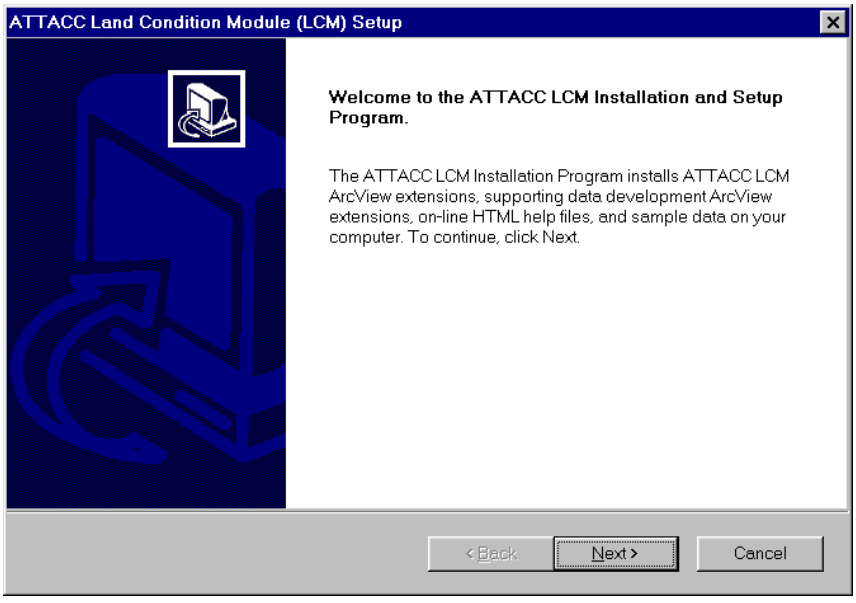


Figure A4. ATTACC LCM installation welcome screen.

You will see a series of three dialog boxes prompting you to provide file locations for the ATTACC LCM extension, online help, and sample data (Figures A5, A6, and A7). Each dialog box provides information concerning required file locations. Use the <*Browse*> button to access the locate file directories dialog box. Use the <*Back*> button to return to earlier ATTACC LCM installation dialog boxes to correct previously provided information. Select the <*Next*> button to proceed to the next input dialog box.

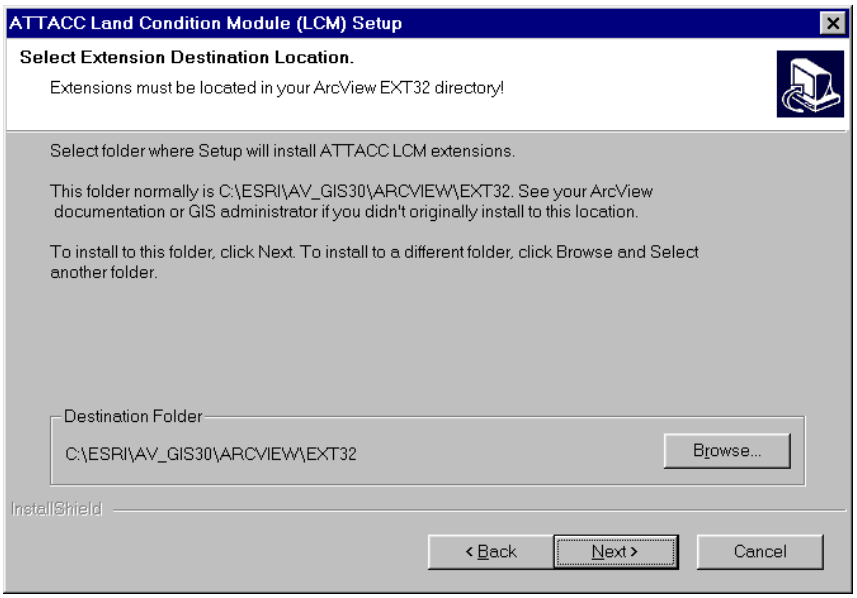


Figure A5. ATTACC LCM installation program dialog box to specify location to write ATTACC LCM extension files.

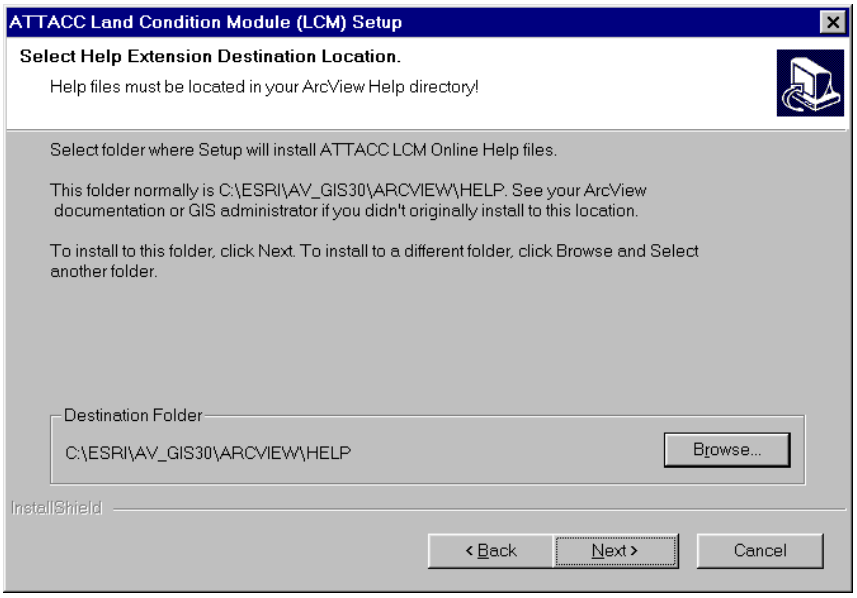


Figure A6. ATTACC LCM installation program dialog box to specify location to write help files.

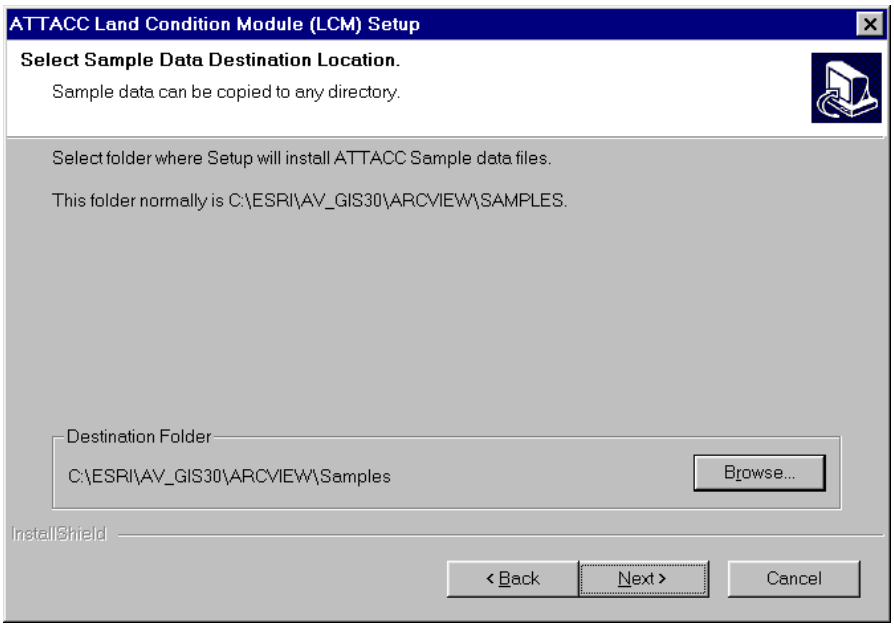


Figure A7. ATTACC LCM installation program dialog box to specify location to sample data files.

After specifying file locations, you will need to specify the type of installation (Figure A8). The *Typical* installation option will install all Arcview extensions, help files, and sample data. The *Compact* installation option will install only Arcview extensions and help files. The *Compact* installation will not install sample data. The *Custom* installation allows you to select the desired extensions, help files, and sample data to install on your computer. Select the <*Next*> button to proceed with the installation.

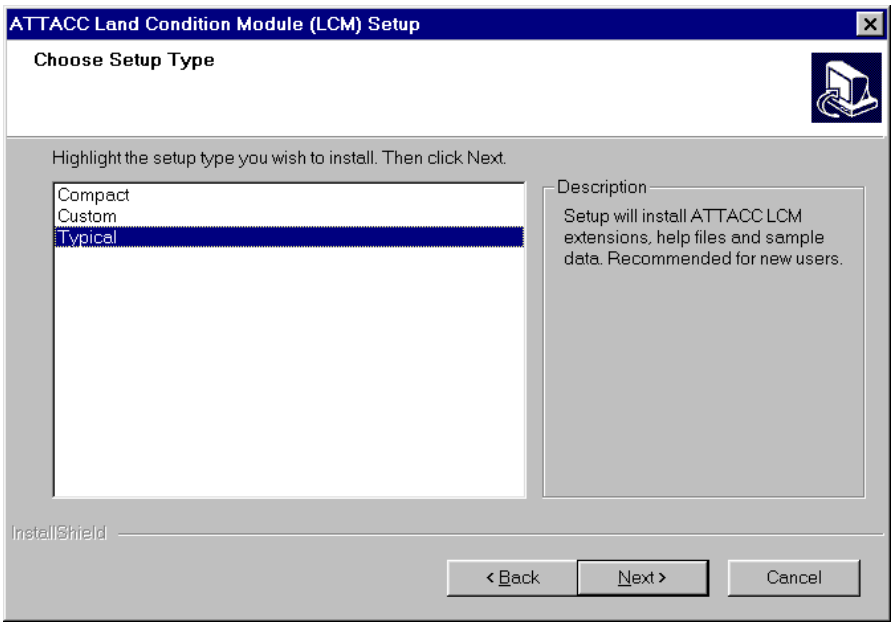


Figure A8. ATTACC LCM installation program setup type selection dialog box.

If you selected the *Custom* installation option, you will proceed to the ATTACC LCM installation program Select Components dialog box (Figure A9). This dialog box will not be seen if you selected the *Typical* or *Compact* setup options. Check each file option that you want installed. Highlighting an option provides supplemental information in the description section of the dialog box. Hard drive space requirements for the selected options and available hard drive space are provided at the bottom of the dialog box. Select the <*Next*> button to proceed with the installation.

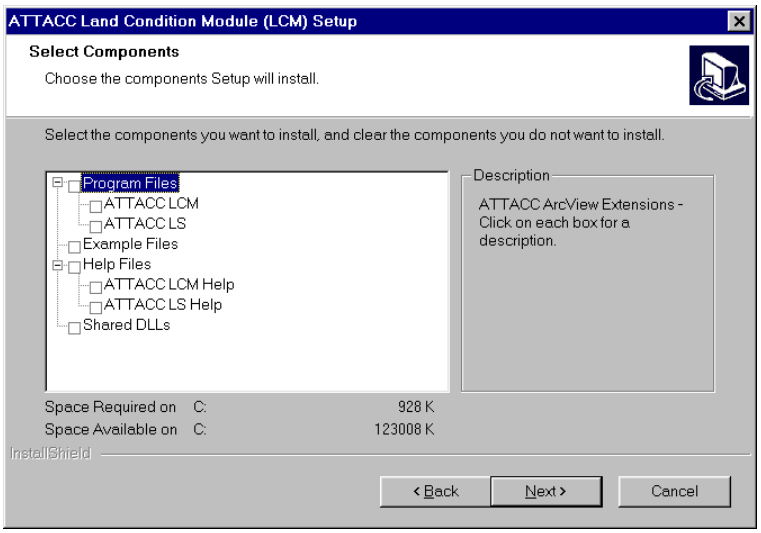


Figure A9. ATTACC LCM installation program select components dialog box.

You will need to provide a file group designation (Figure A10). This can be an existing file group or a new file group. The installation program defaults to the "*ATTACC LCM*" file group. You will probably want to accept the default value. Select the <*Next*> button to proceed with the installation.

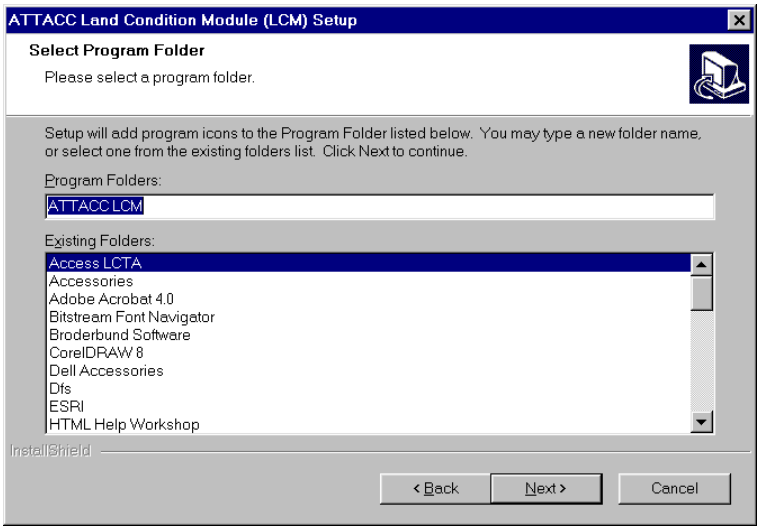


Figure A10. ATTACC LCM installation program folder selection dialog box.

The ATTACC LCM installation program will now install the selected files. The ATTACC LCM installation program Setup Status dialog box (Figure A11) will keep you informed of the installation process.

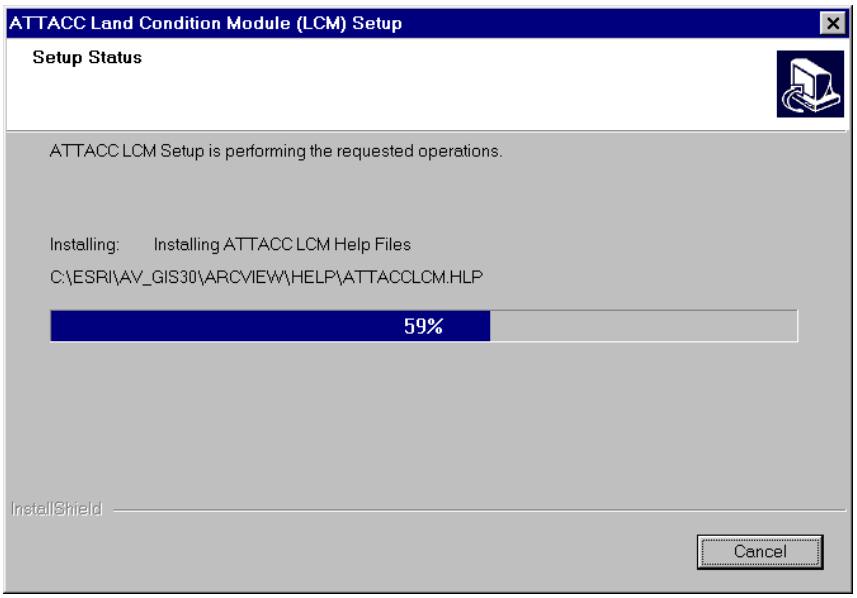


Figure A11. ATTACC LCM installation program setup status dialog box.

When you see the ATTACC LCM installation program completion dialog box (Figure A12), the installation is complete. Select the <*Finish*> button to exit the ATTACC LCM installation program.

Figure A12. ATTACC LCM installation program completion dialog box.

Removing and Updating ATTACC LCM and Related Tools

Use the MS Windows *Add/Remove Programs* utility to remove ATTACC LCM, add modules, or load a newer version. To use this utility, select the <*Start*> button of the Windows button bar at the bottom of your screen. Select the <*Settings*> menu item. Then select the <*Control Panel*> menu item. You should see the Control Panel dialog box (Figure A13). Run the *Add/Remove Programs* utility by selecting the icon.

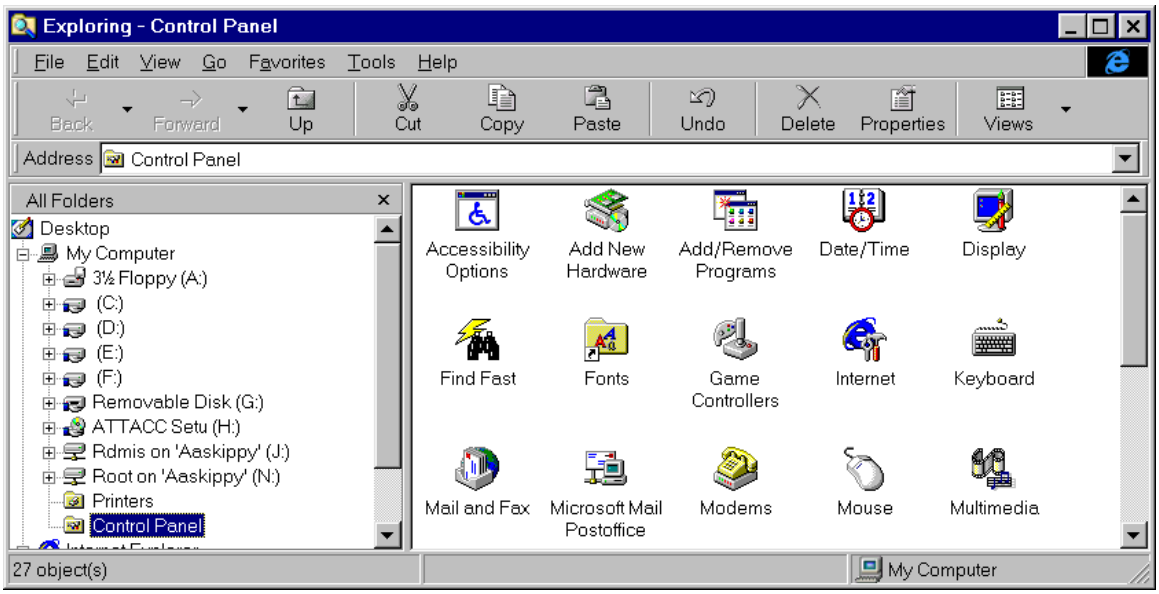


Figure A13. Control Panel dialog box.

You will now see the Add/Remove Programs dialog box (Figure A14). Locate and highlight the *ATTACC LCM* program group. Then use the <*Add/Remove*> button to start the ATTACC LCM remove/update program.

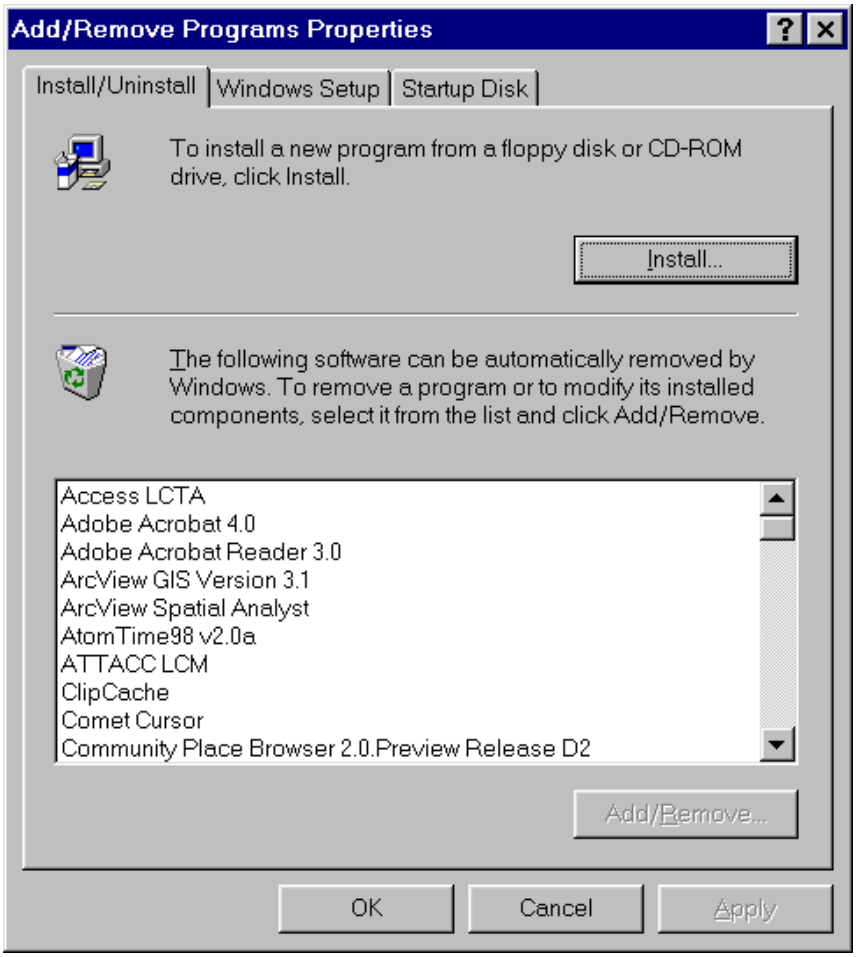


Figure A14. Add/Remove Programs dialog box.

After the ATTACC LCM remove/update program begins, you will see the uninstall program options dialog box (Figure A15). Select the <*Remove*> option to remove all ATTACC LCM components installed on your computer. This option will remove all installed files but will not remove any data files created by the ATTACC LCM program. Select the <*Repair*> option to reinstall the same components originally installed. Use this option if you have corrupted or deleted any files originally installed. Select the <*Modify*> option to add or remove selected ATTACC LCM components. Use this option to remove components no longer needed (i.e., sample data) or add components that were not originally installed. Select the <*Next*> button to proceed with the remove/update program.

Figure A15. ATTACC LCM remove/update program options dialog box.

If you selected *Modify* option, you will see the program maintenance and unistall dialog box. This dialog box will not be seen if you selected the *Repair* or *Remove* options. Check each file option that you want installed and uncheck each file option you want removed. Highlighting an option provides supplemental information in the description section (Figure A16). Hard drive space requirements for the selected options and available hard drive space are provided at the bottom of the dialog box. Select the <*Next*> button to proceed with the installation.

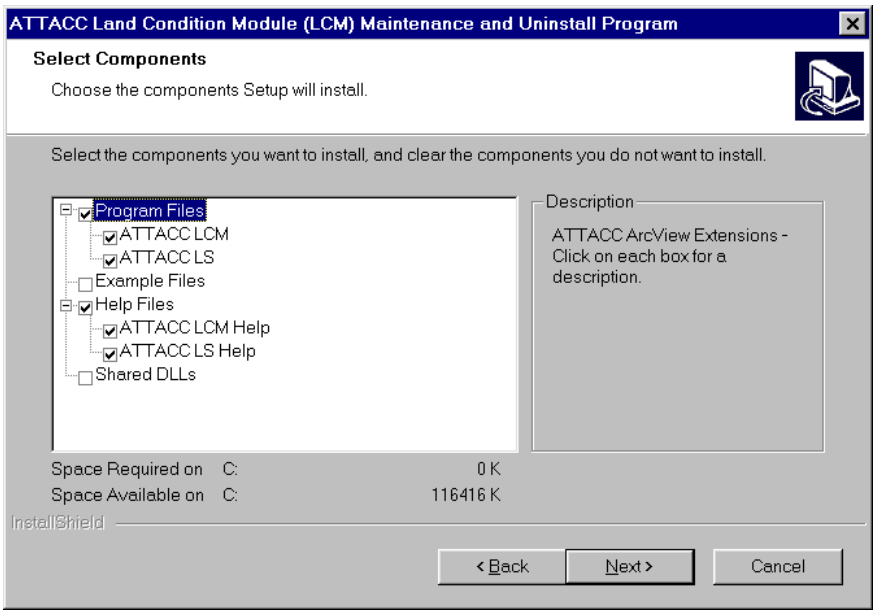


Figure A16. ATTACC LCM installation program maintenance and uninstall dialog box.

You will now see the Setup Status dialog box as your remove/update options are processed (Figure A17). You will see this dialog box regardless of the remove/update options selected.

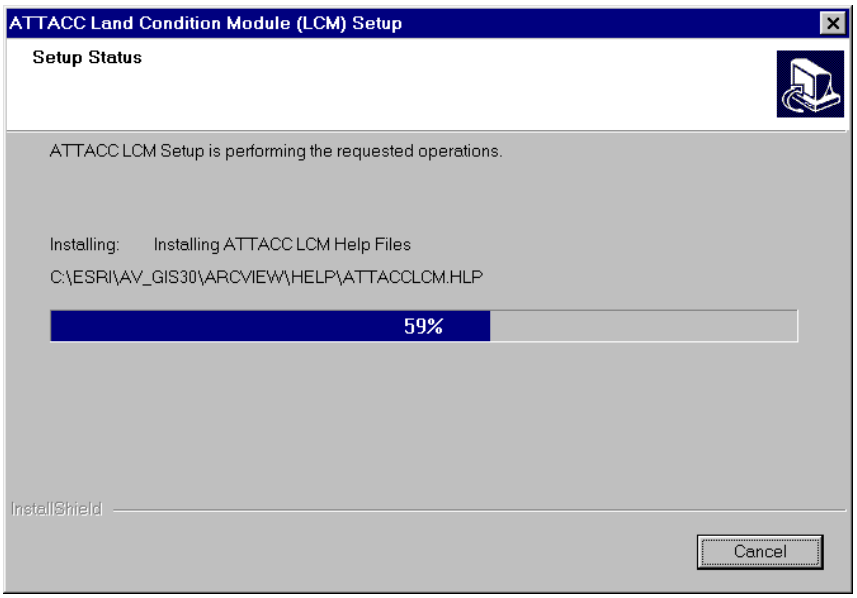


Figure A17. ATTACC LCM remove/update program status dialog box.

When you see the ATTACC LCM remove/update program completion dialog box, the remove/update is complete (Figure A18). Select the <*Finish*> button to exit the ATTACC LCM remove/update program.

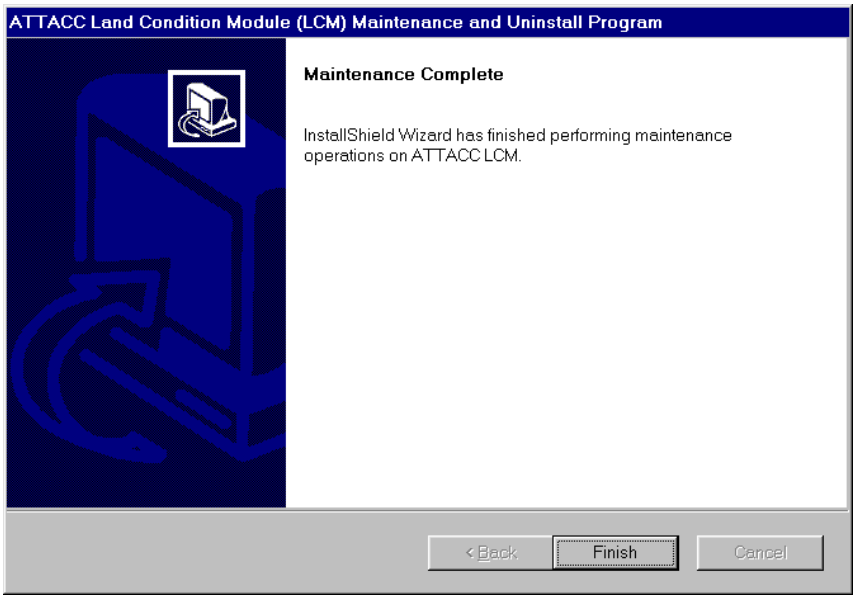


Figure A18. ATTACC LCM remove/update program finish dialog box.

Appendix B: Installation Information Infrastructure Architecture (I3A) Technical Review Process for ATTACC LCM

The Army CIO instituted the I3A Technical Review Process to ensure that all systems being fielded on Army installations are coordinated and reviewed for infrastructure and communications impacts. Program Managers were asked to coordinate their system designs with the U.S. Army Information System Engineering Command (ISEC) to ensure that the proposed fielded system fits within the Army's installation architecture. The following sections document the ATTACC LCM systems architecture information submitted for system approval and the ISEC approval letter.

ATTACC LCM System's Architecture Document

Army Training and Testing Area Carrying Capacity (ATTACC) Land Condition Module (LCM) System's Architecture Document

1. Background

The Integrated Training Area Management (ITAM) Program is the Army's pro-gram for managing training lands. The Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS) is the proponent for the ITAM program. A major objective of ITAM has been to develop a method for estimating training land carrying capacity. The Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS) defines training land carrying capacity as the amount of training that a given parcel of land can accommodate in a sustainable manner, based on a balance of use, condition, and maintenance practices. The Army Training and Testing Area Carrying Capacity (ATTACC) program is an initiative sponsored by the ODCSOPS and the Assistant Secretary of the Army for Installations, Logistics, and Environment [ASA (IL&E)] to estimate training land carrying capacity.

The ATTACC methodology is used to estimate training and testing land carrying capacity and to determine land rehabilitation and maintenance costs associated with land-based training and other uses. The ATTACC Handbook (U.S. Army Environmental Center 1999) documents the standard operating procedures for implementing ATTACC within the ITAM program.

The ATTACC methodology consists of three main components: training load characterization, environmental characterization, and cost analysis. The environmental component of the ATTACC methodology has been automated as an ArcView Geographic Information System (GIS) extension. This software tool is referred to as the Army Training and Testing Area Carrying Capacity (ATTACC) Land Condition Module (LCM). The ATTACC LCM extension was developed for GIS, Land Condition Trend Analysis (LCTA), and ITAM coordinators of the ITAM program of each installation. Currently there are approximately 111 installations involved in the ITAM program.

2. Objective

The objective of this systems architecture document is to coordinate software-fielding requirements with installation information managers and meet documentation requirements of the Installation Information Infrastructure Modernization Program (I3MP).

This systems architecture document was prepared based on guidance provided by the Installation Information Infrastructure Modernization Program (I3MP) as found in "*Memorandum for the Assistant Secretary of Defense, Command, Control, Communications, and Intelligence (ATTN: Mr. Brubaker, Deputy Chief Information Officer), Subject: Fielding DoD Level Systems on Army Installations, October 13, 2000*" and associated documentation.

3. Description of System

The ATTACC LCM software is an ArcView GIS-based software application that estimates changes in land condition associated with mission activity. The ATTACC LCM is written in Avenue code. Avenue is a scripting language used to customize the ArcView GIS interface and automate ArcView GIS tasks. Avenue code is compiled and run completely inside the ArcView GIS system. Avenue code to the ArcView GIS is much like the macro language is to Microsoft Excel.

3.1 ATTACC LCM Software Requirements

The ATTACC LCM software is an ArcView GIS-based software application implemented as an ArcView extension. The ATTACC LCM requires ESRI ArcView 3.0, 3.1, or 3.2; and ESRI Spatial Analyst 1.0 or 2.0. ArcView GIS is a registered trademark of Environmental Systems Research Institute, Inc.

The ATTACC LCM does not require installations to purchase any additional software. Installation GIS software that already exists at installations as part of the ITAM program is all that is required by the ATTACC LCM. This requirement to use existing GIS software was a specific system design criteria established during the system specification stage of software development.

3.2 ATTACC LCM Hardware Requirements

The ATTACC LCM software is an ArcView GIS-based software application implemented as an ArcView extension. As such, the hardware requirements to run ATTACC LCM are identical to the requirements to run ArcView GIS. Currently a typical installation hardware setup used to run ArcView GIS includes a Pentium PC, 32 MB physical memory, and a color monitor with 256 colors.

The ATTACC LCM does not require installations to purchase any additional hardware. Installation GIS hardware that already exists at installations as part of the ITAM program is all that is required by the ATTACC LCM. This requirement to use existing GIS hardware was a specific system design criteria established during the system specification stage of software development.

3.3 ATTACC LCM Users

The ATTACC LCM software automates the environmental component of the ATTACC methodology. The intended users of this software are personnel of the ITAM program located at installations that participate in the ITAM program. Currently there are approximately 111 installations participating in the ITAM program. Primary users of the ATTACC LCM software at an installation are the LCTA, GIS, and ITAM coordinators.

3.4 ATTACC LCM Input Data

The ATTACC LCM software requires installation GIS data as input. Input GIS layers required are core and optional data layers found in the ITAM GIS data repository. An installation's ITAM GIS data repository may be found on a

standalone computer or a network server. The ATTACC LCM software does not require any changes to the installations repository setup. The ATTACC LCM software does not require any changes to the ITAM data repository performance criteria.

3.5 ATTACC LCM Output Data

The ATTACC LCM software's primary output is a text file. The size of the text file is dependent on user specifications but is generally less than 1M.

The ATTACC LCM software generates temporary GIS data layers. The size of these GIS data layers is dependent on input file sizes and user specifications. However, GIS output file sizes are similar to data files currently residing in the ITAM GIS data repository.

3.6 ATTACC LCM Points of Contact

The Army points of contact for additional information about the ATTACC LCM software are:

Mr. Gordon Weith

Army Training and Support Center

Phone: 757-878-3090:

Email: weithg@atsc.army.mil

Mr. George Teachman

Army Environmental Center

Phone: 410-436-1593

Email: george.teachman@aec.apgea.army.mil

The Army point of contact for technical details about the ATTACC LCM software is:

Mr. Alan Anderson

Engineering Research and Development Center

Phone: 217-352-6511 ext 6390

Email: alan.b.Anderson@erdc.usace.army.mil

4. Hardware and Software GOTS and COTS

The ATTACC LCM software requires ESRI ArcView 3.0, 3.1, or 3.2; and ESRI Spatial Analyst 1.0 or 2.0 software. The ATTACC LCM software being an ArcView GIS extension requires a Pentium PC, 32 MB physical memory, and a color monitor with 256 colors.

The ATTACC LCM does not require installations to purchase any software or hardware. GIS software and hardware already exists at installations as part of the ITAM program. The ATTACC LCM only customizes and automates tasks within the existing software enviroment.

5. Interfaces to External Systems

The ATTACC LCM software interfaces with the Range Facility Management and Support System (RFMSS) and ATTACC Integration Module (AIM) systems. The interface to these systems is through a text file. The text file is not dynamically shared between the ATTACC LCM and RFMSS/AIM software. No special hardware or software requirements exist to interface with any other systems.

6. Bandwidth Required for System Operation

The ATTACC LCM software has no bandwidth requirements for system operation. The ATTACC LCM only customizes the interface of ESRI ArcView and automates common tasks of the GIS system. As such the ATTACC LCM has no bandwidth requirements for system operation that have not already been provided for the GIS system.

7. Infrastructure Connectivity Requirements

The ATTACC LCM software has no infrastructure connectivity requirements for system operation. The ATTACC LCM only customizes the interface of ESRI ArcView and automates common tasks of the GIS system. As such the ATTACC LCM has no infrastructure connectivity requirements for system operation that have not already been provided for the GIS system.

8. Security Requirements of the System

The ATTACC LCM software has no security requirements for system operation. The ATTACC LCM only customizes the interface of ESRI ArcView and automates common tasks of the GIS system. As such the ATTACC LCM has no

security requirements for system operation that have not already been provided for the GIS system. An installation ITAM GIS data repository may have security requirements. However the ATTACC LCM does not alter these requirements.

9. Network and System Management

The ATTACC LCM software has no network and system requirements for operation. The ATTACC LCM only customizes the interface of ESRI ArcView and automates common tasks of the GIS system. As such the ATTACC LCM has no network or system requirements for operation that have not already been provided for the GIS system. An installation ITAM GIS system may have network and system requirements. However the ATTACC LCM does not alter these requirements and works within existing configurations and policies

10. Fielding Schedule

The ATTACC LCM software is scheduled for fielding as soon as coordination and documentation requirements have been completed.

11. Supporting Documentation

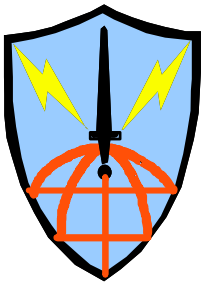
Supporting documentation includes the ATTACC LCM software users manual that describes software installation, setup, and use.

12. Conclusion

The ATTACC LCM software is an ArcView GIS-based software application that estimates changes in land condition associated with mission activity. The ATTACC LCM is written in Avenue code. Avenue is a scripting language used to customize the ArcView GIS interface and automate ArcView GIS tasks. Avenue code is compiled and run completely inside the ArcView GIS system. The relationship between Avenue code and the ArcView GIS system is analogous to the Microsoft Excel macro language and the Microsoft Excel software. As such fielding the ATTACC LCM software should have little to no impact on communications infrastructure and installation information managers.

I3A Technical Review Letter of Compliance

The letter of compliance follows:



U.S. Army Information System Engineering Command (ISEC)
I3A Technical Review Process Team
Fort Huachuca, AZ

March 06, 2001

MEMORANDUM FOR SYSTEM DEVELOPER OF THE ATTACC LCM SYSTEM

SUBJECT: Installation Information Infrastructure Architecture (I3A) Technical Review Letter of Compliance

The Army CIO instituted the I3A Technical Review Process (TRP) to ensure that all systems being fielded on Army installations, requiring communications support, are coordinated and reviewed for infrastructure and communications impacts. It was requested that all Program Managers coordinate their system designs with ISEC to ensure that the proposed fielded system fits within the Army's installation architecture and the impact on the infrastructure is known.

In meeting the Army CIO's directive the technical point of contacts for the Army Training and Testing Area Carrying Capacity (ATTACC) program submitted for review, documentation describing the ATTACC Land Condition Module (LCM).

Since the ATTACC LCM is basically an extension to the Integrated Training Area Management (ITAM) system, no added impact will be placed on the receiving units or the communication infrastructure to support the system. Therefore, the ATTACC LCM system is in compliance with Army CIO guidance and policies and fits within the Army installation architecture and I3A.

The ISEC Point of Contact for the I3A Technical Review Process is Mr. Craig Engel, DSN 879-3172 or Comm (520) 538-3172 or e-mail engelc@hqisec.army.mil

//S//
Craig E. Engel
I3A lead for ISEC

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14. ABSTRACT

ATTACC is the standard ITAM methodology for estimating training land carrying capacity by relating training load, land condition, and land maintenance practices. Various decision support tools have been developed to simplify and automate the ATTACC methodology. These decision support tools include the Workplan Analysis Module (WAM), ATTACC Integration Module (AIM), ATTACC functions of the Range Facility Management Support System (RFMSS), and Land Condition Module (LCM). The LCM is an ArcView GIS-based software application that estimates changes in land condition associated with mission activity. LCM automates the ATTACC methodology for generating land condition curves. Output from the LCM is required for implementing the AIM and ITAM component of RFMSS. This manual contains instructions for installing and using the LCM software.

15. SUBJECT TERMS
Army Training and Testing Area Carrying Capacity (ATTACC) user manual military training modeling
Integrated Training Area Management (ITAM) land management carrying capacity Land Management Systems (LMS)

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